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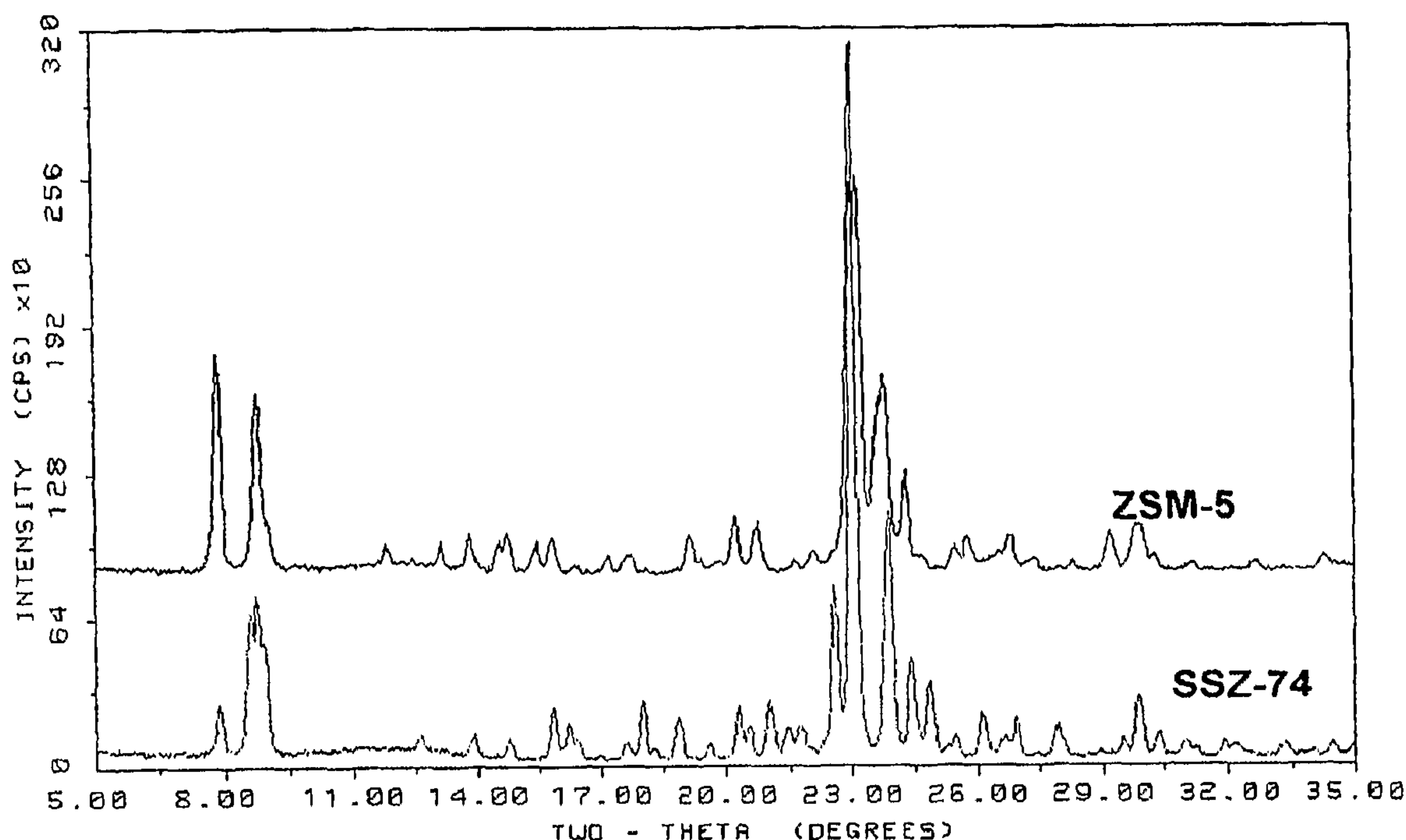
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(72) **Inventeurs/Inventors:**  
ZONES, STACEY I., US;  
BURTON, ALLEN W., US;  
ONG, KENNETH, US

(73) **Propriétaire/Owner:**  
CHEVRON U.S.A. INC., US

(74) **Agent:** SIM & MCBURNEY

(54) **Titre : COMPOSITION DE TAMIS MOLECULAIRE SSZ- 74 ET SA SYNTHÈSE**  
(54) **Title: MOLECULAR SIEVE SSZ-74 COMPOSITION OF MATTER AND SYNTHESIS THEREOF**



(57) **Abrégé/Abstract:**

The present invention relates to new crystalline molecular sieve SSZ- 74 prepared using a hexamethylene-1 ,6-bis-(N-methyl-N-pyrrolidinium) dication as a structure-directing agent, methods for synthesizing SSZ-74, and its use in hydrocarbon conversion reactions, reduction of oxides of nitrogen in a gas stream, partial oxidation reactions, acylation reactions, oxygenate conversions, gas separations, synthesis of amines, treatment of engine exhaust (reduction of cold start emissions), and Beckmann rearrangement.

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## (71) Applicant (for all designated States except US):

CHEVRON U.S.A INC. [US/US]; 6001 Bollinger  
Canyon Road- 3rd Floor, San Ramon, CA 94583 (US).

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## (72) Inventors; and

(75) Inventors/Applicants (for US only): ZONES, Stacey,  
I. [US/US]; 1874 9th Avenue, San Francisco, CA 94122  
(US). BURTON, Allen, W. [US/US]; 91 Bayside Court,  
Richmond, CA 94804 (US). ONG, Kenneth [US/US];  
1716 Wesley Avenue, El Cerrito, CA 94530 (US).

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(74) Agents: SHERIDAN, Richard, J. et al.; Chevron Corpo-  
ration, Law Department, Post Office Box 6006, San Ra-  
mon, CA 94583-0806 (US).

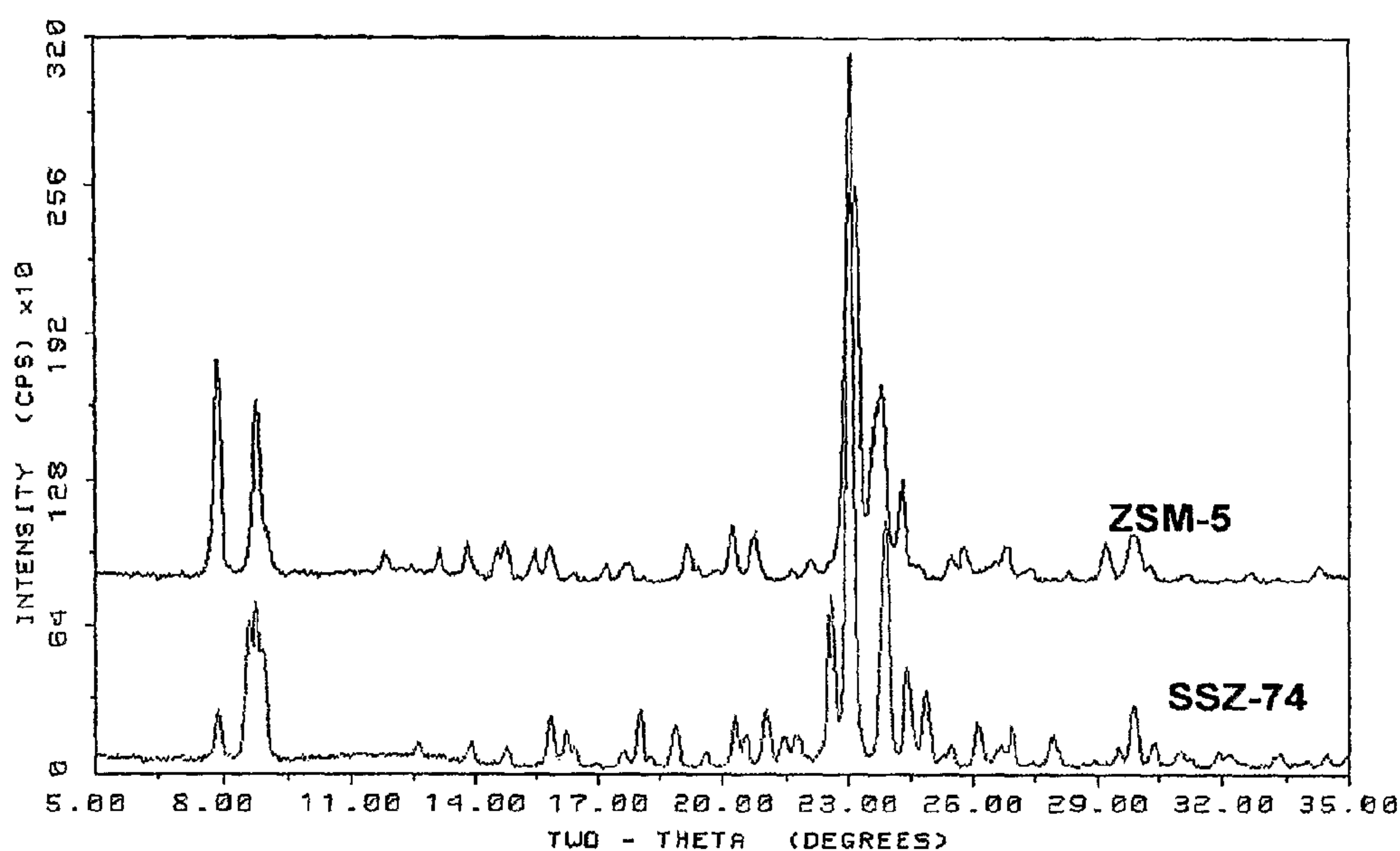
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[Continued on next page]

(54) Title: MOLECULAR SIEVE SSZ-74 COMPOSITION OF MATTER AND SYNTHESIS THEREOF



(57) Abstract: The present invention relates to new crystalline molecular sieve SSZ- 74 prepared using a hexamethylene-1,6-bis-(N-methyl-N-pyrrolidinium) dication as a structure-directing agent, methods for synthesizing SSZ-74, and its use in hydrocarbon conversion reactions, reduction of oxides of nitrogen in a gas stream, partial oxidation reactions, acylation reactions, oxygenate conversions, gas separations, synthesis of amines, treatment of engine exhaust (reduction of cold start emissions), and Beckmann rearrangement.

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1                   **MOLECULAR SIEVE SSZ-74 COMPOSITION OF MATTER**  
2                   **AND SYNTHESIS THEREOF**

3  
4                   **BACKGROUND OF THE INVENTION**

5  
6                   **Field of the Invention**

7  
8                   The present invention relates to new crystalline molecular sieve SSZ-  
9                   74, a method for preparing SSZ-74 using a hexamethylene-1,6-bis-(N-methyl-  
10                  N-pyrrolidinium) dication as a structure directing agent ("SDA") and uses for  
11                  SSZ-74.

12  
13                  **State of the Art**

14  
15                  Because of their unique sieving characteristics, as well as their  
16                  catalytic properties, crystalline molecular sieves and zeolites are especially  
17                  useful in applications such as hydrocarbon conversion, gas drying and  
18                  separation. Although many different crystalline molecular sieves have been  
19                  disclosed, there is a continuing need for new molecular sieves with desirable  
20                  properties for gas separation and drying, hydrocarbon and chemical  
21                  conversions, and other applications. New molecular sieves may contain novel  
22                  internal pore architectures, providing enhanced selectivities in these  
23                  processes.

24  
25                  **SUMMARY OF THE INVENTION**

26  
27                  The present invention is directed to a family of crystalline molecular  
28                  sieves with unique properties, referred to herein as "molecular sieve SSZ-74"  
29                  or simply "SSZ-74".  
30

1 According to another aspect, there is provided a crystalline molecular sieve  
 2 having a mole ratio greater than about 15 of (1) an oxide of a first tetravalent  
 3 element to (2) an oxide of a trivalent element, pentavalent element, second  
 4 tetravalent element which is different from said first tetravalent element or  
 5 mixture thereof and having, after calcination, the X-ray diffraction lines shown  
 6 in Table II below:

7

8

9

| <u>TABLE II</u>              |                              |                                          |
|------------------------------|------------------------------|------------------------------------------|
| <u>Calcined SSZ-74</u>       |                              |                                          |
| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              |                                          |

10

11

12 According to another aspect, there is provided a crystalline molecular sieve  
 13 having a composition comprising, as synthesized and in the anhydrous state,  
 14 in terms of mole ratios, the following:

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18

19

20 wherein X is aluminum, gallium, iron, boron, titanium, indium and  
 21 mixtures thereof, c is 1 or 2; d is 2 when c is 1, or d is 3 or 5 when c is 2, M is  
 22 an alkali metal cation, alkaline earth metal cation or mixtures thereof; n is the  
 23 valence of M; Q is a hexamethylene-1,6-bis-(N-methyl-N-pyrrolidinium)  
 24 dication and F is fluoride.

According to a further aspect, there is provided a method of preparing a crystalline material, said method comprising contacting under crystallization conditions (1) a source of silicon oxide, (2) a source of aluminum oxide, gallium oxide, iron oxide, boron oxide, titanium oxide, indium oxide and mixtures thereof, (3) fluoride ions and (4) a structure directing agent comprising a hexamethylene-1,6-bis-(N-methyl-N-pyrrolidinium) dication.

According to another aspect, there is provided a process for converting hydrocarbons comprising contacting a hydrocarbonaceous feed at hydrocarbon converting conditions with a catalyst comprising a crystalline molecular sieve having a mole ratio greater than about 15 of (1) an oxide of a first tetravalent element to (2) an oxide of a trivalent element, pentavalent element, second tetravalent element which is different from said first tetravalent element or mixture thereof and having, after calcination, the X-ray diffraction lines shown in Table II below:

TABLE II

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| <sup>(a)</sup> ± 0.1         |                              |                                          |

According to a further aspect, there is provided a catalyst composition for promoting polymerization of 1-olefins, said composition comprising

(A) a crystalline molecular sieve having a mole ratio greater than about 15 of (1) an oxide of a first tetravalent element to (2) an oxide of a trivalent element, pentavalent element, second tetravalent element which is different from said first tetravalent element or mixture thereof and having, after calcination, the X-ray diffraction lines shown in Table II below:

TABLE II

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |

<sup>(a)</sup>  $\pm 0.1$

; and

(B) an organotitanium or organochromium compound.

According to another aspect, there is provided a process for converting oxygenated hydrocarbons comprising contacting said oxygenated hydrocarbon under conditions to produce liquid products with a catalyst comprising a molecular sieve having a mole ratio greater than about 15 of an oxide of a first tetravalent element to an oxide of a second tetravalent element which is different from said first tetravalent element, trivalent element, pentavalent element or mixture thereof and having, after calcination, the X-ray diffraction lines shown in Table II below:

TABLE II

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              |                                          |

According to a further aspect, there is provided a process for hydrotreating a hydrocarbon feedstock comprising contacting the feedstock with a hydrotreating catalyst and hydrogen under hydrotreating conditions, wherein the catalyst comprises a crystalline molecular sieve having a mole ratio greater than about 15 of (1) an oxide of a first tetravalent element to (2) an oxide of a trivalent element, pentavalent element, second tetravalent element which is different from said first tetravalent element or mixture thereof and having, after calcination, the X-ray diffraction lines shown in of Table II below:

TABLE II

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              |                                          |

1

2 According to another aspect, there is provided a process for the reduction of  
 3 oxides of nitrogen contained in a gas stream wherein said process comprises  
 4 contacting the gas stream with a crystalline molecular sieve having a mole  
 5 ratio greater than about 15 of (1) an oxide of a first tetravalent element to (2)  
 6 an oxide of a trivalent element, pentavalent element, second tetravalent  
 7 element which is different from said first tetravalent element or mixture thereof  
 8 and having, after calcination, the X-ray diffraction lines shown in Table II  
 9 below:

10

TABLE II

11

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |

12

<sup>(a)</sup> ± 0.1

13 According to a further aspect, there is provided a process for oxidation of  
 14 hydrocarbons comprising contacting said hydrocarbon with an oxidizing agent  
 15 in the presence of a catalytically effective amount of a titanium-containing  
 16 molecular sieve for a time and at a temperature effective to oxidize said  
 17 hydrocarbon, wherein the titanium-containing molecular sieve is a molecular  
 18 sieve having a mole ratio greater than about 15 of (1) silicon oxide to (2)  
 19 titanium oxide and having, after calcination, the X-ray diffraction lines shown  
 20 in Table II below:

TABLE II

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              |                                          |

According to another aspect, there is provided a process for epoxidation of an olefin comprising contacting said olefin with hydrogen peroxide in the presence of a catalytically effective amount of a titanium-containing molecular sieve for a time and at a temperature effective to epoxidize said olefin, wherein the titanium-containing molecular sieve is a molecular sieve having a mole ratio greater than about 15 of (1) silicon oxide to (2) titanium oxide and having, after calcination, the X-ray diffraction lines shown in Table II below:

TABLE II

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              |                                          |

According to a further aspect, there is provided a process for oxidizing cyclohexane comprising contacting said cyclohexane with hydrogen peroxide in the presence of a catalytically effective amount of a titanium-containing molecular sieve for a time and at a temperature effective to oxidize said cyclohexane, wherein the titanium-containing molecular sieve is a molecular sieve having a mole ratio greater than about 15 of (1) silicon oxide to (2) titanium oxide and having, after calcination, the X-ray diffraction lines shown in Table II below:

TABLE II

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| <sup>(a)</sup> $\pm 0.1$     |                              |                                          |

According to another aspect, there is provided a catalytic oxidation process comprising contacting under oxidation conditions (1) a reactant which is catalytically oxidizable in the presence of hydrogen peroxide, (2) aqueous hydrogen peroxide and (3) a catalytically effective amount of an oxidation catalyst comprising a molecular sieve having a mole ratio greater than about 15 of (1) silicon oxide to (2) titanium oxide and having, after calcination, the X-ray diffraction lines shown in Table II below:

1

2

3

TABLE IICalcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              |                                          |

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According to a further aspect, there is provided a process for the epoxidation of an olefin comprising contacting said olefin with hydrogen peroxide in the presence of a catalytically effective amount of a catalyst comprising a molecular sieve having a mole ratio greater than about 15 of (1) silicon oxide to (2) titanium oxide and having, after calcination, the X-ray diffraction lines shown in Table II below:

TABLE IICalcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              |                                          |

14

1

2 According to another aspect, there is provided a method for performing an  
 3 acylation reaction on an aromatic substrate  $\text{ArH}_n$  to form a product  
 4  $\text{ArH}_{n-1}\text{COR}$ , the method comprising the steps of:

5

6 providing the aromatic substrate,

7

8 intimately mixing the substrate and an acylating agent, wherein the acylating  
 9 agent is selected from the group consisting of a carboxylic acid derivative, a  
 10 carboxylic acid, an acid anhydride, an ester, and an acyl halide, and

11

12 exposing an intimate mixture thus formed to a catalyst comprising a crystalline  
 13 molecular sieve having a mole ratio greater than about 15 of (1) an oxide of a  
 14 first tetravalent element to (2) an oxide of a trivalent element, pentavalent  
 15 element, second tetravalent element which is different from said first  
 16 tetravalent element or mixture thereof and having, after calcination, the X-ray  
 17 diffraction lines shown in Table II below:

18

TABLE II

19

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              |                                          |

20

21

22 According to a further aspect, there is provided a process for the production of  
 23 light olefins from a feedstock comprising an oxygenate or mixture of  
 24 oxygenates, the process comprising reacting the feedstock at effective  
 25 conditions over a catalyst comprising a crystalline molecular sieve having a

1 mole ratio greater than about 15 of (1) an oxide of a first tetravalent element  
 2 to (2) an oxide of a trivalent element, pentavalent element, second tetravalent  
 3 element which is different from said first tetravalent element or mixture thereof  
 4 and having, after calcination, the X-ray diffraction lines shown in Table II  
 5 below:

6 TABLE II

7 Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              |                                          |

8  
 9  
 10 According to another aspect, there is provided a process for separating  
 11 gasses comprising contacting a mixture of gasses with a membrane  
 12 containing a molecular sieve wherein the molecular sieve comprises a  
 13 crystalline molecular sieve having a mole ratio greater than about 15 of (1) an  
 14 oxide of a first tetravalent element to (2) an oxide of a trivalent element,  
 15 pentavalent element, second tetravalent element which is different from said  
 16 first tetravalent element or mixture thereof and having, after calcination, the  
 17 X-ray diffraction lines shown in Table II below:

TABLE II

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              |                                          |

According to a further aspect, there is provided a process for producing methylamine or dimethylamine comprising reacting methanol, dimethyl ether or a mixture thereof and ammonia in the gaseous phase in the presence of a catalyst comprising a crystalline molecular sieve having a mole ratio greater than about 15 of (1) an oxide of a first tetravalent element to (2) an oxide of a trivalent element, pentavalent element, second tetravalent element which is different from said first tetravalent element or mixture thereof and having, after calcination, the X-ray diffraction lines shown in Table II below:

TABLE II

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              |                                          |

1  
2 According to another aspect, there is provided a process for treating a cold-  
3 start engine exhaust gas stream containing hydrocarbons and other pollutants  
4 consisting of flowing said engine exhaust gas stream over a molecular sieve  
5 bed which preferentially adsorbs the hydrocarbons over water to provide a  
6 first exhaust stream, and flowing the first exhaust gas stream over a catalyst  
7 to convert any residual hydrocarbons and other pollutants contained in the  
8 first exhaust gas stream to innocuous products and provide a treated exhaust  
9 stream and discharging the treated exhaust stream into the atmosphere, the  
10 molecular sieve bed comprising a crystalline molecular sieve having a mole  
11 ratio greater than about 15 of (1) an oxide of a first tetravalent element to  
12 (2) an oxide of a trivalent element, pentavalent element, second tetravalent  
13 element which is different from said first tetravalent element or mixture thereof  
14 and having, after calcination, the X-ray diffraction lines shown in Table II  
15 below:

16

17 TABLE II

18 Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              |                                          |

19

20

21 According to a further aspect, there is provided a process for the preparation  
22 of amides from oximes via Beckmann rearrangement comprising contacting  
23 the oxime in the vapor phase with a catalyst comprising a crystalline  
24 molecular sieve having a mole ratio greater than about 15 of (1) an oxide of a

1 first tetravalent element to (2) an oxide of a trivalent element, pentavalent  
 2 element, second tetravalent element which is different from said first  
 3 tetravalent element or mixture thereof and having, after calcination, the X-ray  
 4 diffraction lines shown in Table II below:

6 TABLE II

7 Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              |                                          |

10 According to another aspect, there is provided a crystalline molecular sieve  
 11 having a composition comprising, as synthesized and in the anhydrous state,  
 12 in terms of mole ratios, the following:

13  $\text{SiO}_2 / \text{X}_c\text{O}_d$  greater than 100

14  $\text{M}_{2/n} / \text{SiO}_2$  0 – 0.03

15  $\text{Q} / \text{SiO}_2$  0.30 – 0.70

16  $\text{F} / \text{SiO}_2$  0.30 – 0.70

17  
 18 wherein X is aluminum, gallium, iron, boron, titanium, indium and mixtures  
 19 thereof, c is 1 or 2; d is 2 when c is 1, or d is 3 or 5 when c is 2, M is an alkali  
 20 metal cation, alkaline earth metal cation or mixtures thereof; n is the valence  
 21 of M; Q is a hexamethylene-1,6-bis-(N-methyl-N-pyrrolidinium) dication and F  
 22 is fluoride, and

1

2 wherein the crystalline molecular sieve has, after calcination, the X-ray  
3 diffraction lines shown in Table II below:

4

5

6

| <u>TABLE II</u>              |                              |                                          |
|------------------------------|------------------------------|------------------------------------------|
| <u>Calcined SSZ-74</u>       |                              |                                          |
| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              |                                          |

7

8

9 According to another aspect, there is provided a method of preparing a  
10 crystalline molecular sieve, said method comprising contacting under  
11 crystallization conditions (1) a source of silicon oxide, (2) a source of  
12 aluminum oxide, gallium oxide, iron oxide, boron oxide, titanium oxide, indium  
13 oxide and mixtures thereof, (3) fluoride ions and (4) a structure directing agent  
14 comprising a hexamethylene-1,6-bis-(N-methyl-N-pyrrolidinium) dication, and  
15 wherein the crystalline molecular sieve has, after calcination, the X-ray  
16 diffraction lines shown in Table II below:

17

1

2

3

TABLE IICalcined SSZ-742 Theta<sup>(a)</sup>d-spacing (Angstroms)Relative Integrated  
Intensity (%)

7.98

11.07

M

8.70

10.16

VS

8.89

9.93

S

9.08

9.74

S

14.02

6.31

W

14.93

5.93

M

16.03

5.52

M

23.26

3.82

VS

23.95

3.71

W

24.08

3.69

M

4

<sup>(a)</sup> ± 0.1

5

## Composition of Matter and Synthesis

In accordance with the present invention there is provided a molecular sieve having a mole ratio greater than about 15 of (1) an oxide of a first tetravalent element to (2) an oxide of a trivalent element, pentavalent element, second tetravalent element which is different from said first tetravalent element or mixture thereof and having, after calcination, the X-ray diffraction lines of Table II. It should be noted that the phrase "mole ratio greater than about 15" includes the case where there is no oxide (2), i.e., the mole ratio of oxide (1) to oxide (2) is infinity. In that case the molecular sieve is comprised of essentially all silicon oxide.

The present invention also provides a crystalline molecular sieve having a mole ratio greater than about 15 of (1) silicon oxide to (2) an oxide selected from aluminum oxide, gallium oxide, iron oxide, boron oxide, titanium oxide, indium oxide and mixtures thereof, and having, after calcination, the X-ray diffraction lines of Table II.

The present invention further provides such a crystalline molecular sieve having a composition comprising, as synthesized and in the anhydrous state, in terms of mole ratios the following:

|                                       |                  |
|---------------------------------------|------------------|
| $\text{SiO}_2 / \text{X}_c\text{O}_d$ | greater than 100 |
| $\text{M}_{2/n} / \text{SiO}_2$       | 0 – 0.03         |
| $\text{Q} / \text{SiO}_2$             | 0.30 – 0.70      |
| $\text{F} / \text{SiO}_2$             | 0.30 – 0.70      |

wherein X is aluminum, gallium, iron, boron, titanium, indium and mixtures thereof, c is 1 or 2; d is 2 when c is 1 (i.e., W is tetravalent) or d is 3 or 5 when c is 2 (i.e., d is 3 when W is trivalent or 5 when W is pentavalent), M is an alkali metal cation, alkaline earth metal cation or mixtures thereof; n is the valence of M (i.e., 1 or 2); Q is a hexamethylene-1,6-bis-(N-methyl-N-pyrrolidinium) dication and F is fluoride.

Also provided in accordance with the present invention is a method of preparing a crystalline material, said method comprising contacting under crystallization conditions a source(s) of (1) silicon oxide, (2) a source(s) of aluminum oxide, gallium oxide, iron oxide, boron oxide, titanium oxide, indium oxide and mixtures thereof, (3) fluoride ions and (4) a structure directing agent comprising a hexamethylene-1,6-bis-(N-methyl-N-pyrrolidinium) dication. The present invention includes such a method wherein the crystalline material has, after calcination, the X-ray diffraction lines of Table II.

The present invention includes such a method of preparing a crystalline material which uses a reaction mixture comprising (in terms of mole ratios), the following:

|                                       |                   |
|---------------------------------------|-------------------|
| $\text{SiO}_2 / \text{X}_a\text{O}_b$ | 100/1 and greater |
| $\text{OH}^- / \text{SiO}_2$          | 0.20 – 0.80       |
| $\text{Q} / \text{SiO}_2$             | 0.20 – 0.80       |
| $\text{M}_{2/n} / \text{SiO}_2$       | 0 – 0.04          |
| $\text{H}_2\text{O} / \text{SiO}_2$   | 2 – 10            |
| $\text{HF} / \text{SiO}_2$            | 0.20 – 0.80       |

wherein X is aluminum, gallium, iron, boron, titanium, indium and mixtures thereof, a is 1 or 2, b is 2 when a is 1 (i.e., W is tetravalent); b is 3 when a is 2 (i.e., W is trivalent), M is an alkali metal cation, alkaline earth metal cation or mixtures thereof; n is the valence of M (i.e., 1 or 2); and Q is a hexamethylene-1,6-bis-(N-methyl-N-pyrrolidinium) dication.

#### Hydrocarbon Conversion

In accordance with the present invention there is provided a process for converting hydrocarbons comprising contacting a hydrocarbonaceous feed at hydrocarbon converting conditions with a catalyst comprising a crystalline molecular sieve having a mole ratio greater than about 15 of (1) an oxide of a

1 first tetravalent element to (2) an oxide of a trivalent element, pentavalent  
2 element, second tetravalent element which is different from said first  
3 tetravalent element or mixture thereof and having, after calcination, the X-ray  
4 diffraction lines of Table II.. The molecular sieve may be predominantly in the  
5 hydrogen form. It may also be substantially free of acidity.

6  
7 Further provided by the present invention is a hydrocracking process  
8 comprising contacting a hydrocarbon feedstock under hydrocracking  
9 conditions with a catalyst comprising the molecular sieve of this invention. The  
10 molecular sieve may be predominantly in the hydrogen form.

11  
12 This invention also includes a dewaxing process comprising contacting  
13 a hydrocarbon feedstock under dewaxing conditions with a catalyst  
14 comprising the molecular sieve of this invention. The molecular sieve may be  
15 predominantly in the hydrogen form.

16  
17 The present invention also includes a process for improving the  
18 viscosity index of a dewaxed product of waxy hydrocarbon feeds comprising  
19 contacting the waxy hydrocarbon feed under isomerization dewaxing  
20 conditions with a catalyst comprising the molecular sieve of this invention. The  
21 molecular sieve may be predominantly in the hydrogen form.

22  
23 The present invention further includes a process for producing a C<sub>20+</sub>  
24 lube oil from a C<sub>20+</sub> olefin feed comprising isomerizing said olefin feed under  
25 isomerization conditions over a catalyst comprising the molecular sieve of this  
26 invention. The molecular sieve may be predominantly in the hydrogen form.  
27 The catalyst may contain at least one Group VIII metal.

28  
29 In accordance with this invention, there is also provided a process for  
30 catalytically dewaxing a hydrocarbon oil feedstock boiling above about 350°F  
31 (177°C) and containing straight chain and slightly branched chain  
32 hydrocarbons comprising contacting said hydrocarbon oil feedstock in the  
33 presence of added hydrogen gas at a hydrogen pressure of about 15-3000 psi

1 (0.103 – 20.7 MPa) with a catalyst comprising the molecular sieve of this  
2 invention. The molecular sieve may be predominantly in the hydrogen form.  
3 The catalyst may contain at least one Group VIII metal. The catalyst may be a  
4 combination comprising the molecular sieve of this invention, and  
5 aluminosilicate zeolite which is more shape selective than the molecular  
6 sieve. The combination may contain at least one Group VIII metal.

7  
8 Also included in the present invention is a process for preparing a  
9 lubricating oil which comprises hydrocracking in a hydrocracking zone a  
10 hydrocarbonaceous feedstock to obtain an effluent comprising a  
11 hydrocracked oil, and catalytically dewaxing said effluent comprising  
12 hydrocracked oil at a temperature of at least about 400°F (204°C) and at a  
13 pressure of from about 15 psig to about 3000 psig (0.103 – 20.7 Mpa  
14 gauge) in the presence of added hydrogen gas with a catalyst comprising the  
15 molecular sieve of this invention. The molecular sieve may be predominantly  
16 in the hydrogen form. The catalyst may contain at least one Group VIII metal.

17  
18 Further included in this invention is a process for isomerization  
19 dewaxing a raffinate comprising contacting said raffinate in the presence of  
20 added hydrogen with a catalyst comprising the molecular sieve of this  
21 invention. The raffinate may be bright stock, and the molecular sieve may be  
22 predominantly in the hydrogen form. The catalyst may contain at least one  
23 Group VIII metal.

24  
25 Also included in this invention is a process for increasing the octane of  
26 a hydrocarbon feedstock to produce a product having an increased aromatics  
27 content comprising contacting a hydrocarbonaceous feedstock which  
28 comprises normal and slightly branched hydrocarbons having a boiling range  
29 above about 40°C and less than about 200°C, under aromatic conversion  
30 conditions with a catalyst comprising the molecular sieve of this invention  
31 made substantially free of acidity by neutralizing said molecular sieve with a  
32 basic metal. Also provided in this invention is such a process wherein the  
33 molecular sieve contains a Group VIII metal component.

1  
2 Also provided by the present invention is a catalytic cracking process  
3 comprising contacting a hydrocarbon feedstock in a reaction zone under  
4 catalytic cracking conditions in the absence of added hydrogen with a catalyst  
5 comprising the molecular sieve of this invention. The molecular sieve may be  
6 predominantly in the hydrogen form. Also included in this invention is such a  
7 catalytic cracking process wherein the catalyst additionally comprises a large  
8 pore crystalline cracking component.

9  
10 This invention further provides an isomerization process for isomerizing  
11 C<sub>4</sub> to C<sub>7</sub> hydrocarbons, comprising contacting a feed having normal and  
12 slightly branched C<sub>4</sub> to C<sub>7</sub> hydrocarbons under isomerizing conditions with a  
13 catalyst comprising the molecular sieve of this invention. The molecular sieve  
14 may be predominantly in the hydrogen form. The molecular sieve may be  
15 impregnated with at least one Group VIII metal, for example platinum. The  
16 catalyst may be calcined in a steam/air mixture at an elevated temperature  
17 after impregnation of the Group VIII metal.

18  
19 Also provided by the present invention is a process for alkylating an  
20 aromatic hydrocarbon which comprises contacting under alkylation conditions  
21 at least a molar excess of an aromatic hydrocarbon with a C<sub>2</sub> to C<sub>20</sub> olefin  
22 under at least partial liquid phase conditions and in the presence of a catalyst  
23 comprising the molecular sieve of this invention. The molecular sieve may be  
24 predominantly in the hydrogen form. The olefin may be a C<sub>2</sub> to C<sub>4</sub> olefin, and  
25 the aromatic hydrocarbon and olefin may be present in a molar ratio of about  
26 4:1 to about 20:1, respectively. The aromatic hydrocarbon may be selected  
27 from the group consisting of benzene, toluene, ethylbenzene, xylene,  
28 naphthalene, naphthalene derivatives, dimethylnaphthalene or mixtures  
29 thereof.

30  
31 Further provided in accordance with this invention is a process for  
32 transalkylating an aromatic hydrocarbon which comprises contacting under  
33 transalkylating conditions an aromatic hydrocarbon with a polyalkyl aromatic

1 hydrocarbon under at least partial liquid phase conditions and in the presence  
2 of a catalyst comprising the molecular sieve of this invention. The molecular  
3 sieve may be predominantly in the hydrogen form. The aromatic hydrocarbon  
4 and the polyalkyl aromatic hydrocarbon may be present in a molar ratio of  
5 from about 1:1 to about 25:1, respectively.

6  
7 The aromatic hydrocarbon may be selected from the group consisting  
8 of benzene, toluene, ethylbenzene, xylene, or mixtures thereof, and the  
9 polyalkyl aromatic hydrocarbon may be a dialkylbenzene.

10  
11 Further provided by this invention is a process to convert paraffins to  
12 aromatics which comprises contacting paraffins under conditions which cause  
13 paraffins to convert to aromatics with a catalyst comprising the molecular  
14 sieve of this invention, said catalyst comprising gallium, zinc, or a compound  
15 of gallium or zinc.

16  
17 In accordance with this invention there is also provided a process for  
18 isomerizing olefins comprising contacting said olefin under conditions which  
19 cause isomerization of the olefin with a catalyst comprising the molecular  
20 sieve of this invention.

21  
22 Further provided in accordance with this invention is a process for  
23 isomerizing an isomerization feed comprising an aromatic C<sub>8</sub> stream of xylene  
24 isomers or mixtures of xylene isomers and ethylbenzene, wherein a more  
25 nearly equilibrium ratio of ortho-, meta- and para-xylenes is obtained, said  
26 process comprising contacting said feed under isomerization conditions with a  
27 catalyst comprising the molecular sieve of this invention.

28  
29 The present invention further provides a process for oligomerizing  
30 olefins comprising contacting an olefin feed under oligomerization conditions  
31 with a catalyst comprising the molecular sieve of this invention.

32

1           This invention also provides a process for converting oxygenated  
2 hydrocarbons comprising contacting said oxygenated hydrocarbon with a  
3 catalyst comprising the molecular sieve of this invention under conditions to  
4 produce liquid products. The oxygenated hydrocarbon may be a lower  
5 alcohol.

6  
7           Further provided in accordance with the present invention is a process  
8 for the production of higher molecular weight hydrocarbons from lower  
9 molecular weight hydrocarbons comprising the steps of:

- 10           (a)       introducing into a reaction zone a lower molecular weight  
11                      hydrocarbon-containing gas and contacting said gas in said  
12                      zone under  $C_2+$  hydrocarbon synthesis conditions with the  
13                      catalyst and a metal or metal compound capable of converting  
14                      the lower molecular weight hydrocarbon to a higher molecular  
15                      weight hydrocarbon; and  
16           (b)       withdrawing from said reaction zone a higher molecular weight  
17                      hydrocarbon-containing stream.

18  
19           The present invention further provides a process for hydrogenating a  
20 hydrocarbon feed containing unsaturated hydrocarbons, the process  
21 comprising contacting the feed and hydrogen under conditions which cause  
22 hydrogenation with a catalyst comprising the molecular sieve of this invention.  
23 The catalyst can also contain metals, salts or complexes wherein the metal is  
24 selected from the group consisting of platinum, palladium, rhodium, iridium or  
25 combinations thereof, or the group consisting of nickel, molybdenum, cobalt,  
26 tungsten, titanium, chromium, vanadium, rhenium, manganese and  
27 combinations thereof.

28  
29           The present invention also provides a catalyst composition for  
30 promoting polymerization of 1-olefins, said composition comprising

- 31  
32           (A)       a crystalline molecular sieve having a mole ratio greater than  
33                      about 15 of (1) an oxide of a first tetravalent element to (2) an

1 oxide of a trivalent element, pentavalent element, second  
2 tetravalent element which is different from said first tetravalent  
3 element or mixture thereof and having, after calcination, the  
4 X-ray diffraction lines of Table II; and  
5

6 (B) an organotitanium or organochromium compound.  
7

8 Also provided is a process for polymerizing 1-olefins, which process  
9 comprises contacting 1-olefin monomer with a catalytically effective amount of  
10 a catalyst composition comprising  
11

12 (A) a crystalline molecular sieve having a mole ratio greater than  
13 about 15 of (1) an oxide of a first tetravalent element to (2) an  
14 oxide of a trivalent element, pentavalent element, second  
15 tetravalent element which is different from said first tetravalent  
16 element or mixture thereof and having, after calcination, the  
17 X-ray diffraction lines of Table II; and  
18

19 (B) an organotitanium or organochromium compound.  
20

21 under polymerization conditions which include a temperature and pressure  
22 suitable for initiating and promoting the polymerization reaction. The 1-olefin  
23 may be ethylene.  
24

25 In accordance with this invention, there is also provided a process for  
26 hydrotreating a hydrocarbon feedstock comprising contacting the feedstock  
27 with a hydrotreating catalyst and hydrogen under hydrotreating conditions,  
28 wherein the catalyst comprises the molecular sieve of this invention.  
29

30 The present invention also provides such a process wherein the  
31 molecular sieve has a mole ratio greater than about 15 of (1) silicon oxide to  
32 (2) an oxide selected from aluminum oxide, gallium oxide, iron oxide, boron  
33 oxide, titanium oxide, indium oxide and mixtures thereof.

## Reduction of Oxides of Nitrogen

In accordance with this invention, there is provided a process for the reduction of oxides of nitrogen contained in a gas stream wherein said process comprises contacting the gas stream with a crystalline molecular sieve having a mole ratio greater than about 15 of (1) an oxide of a first tetravalent element to (2) an oxide of a trivalent element, pentavalent element, second tetravalent element which is different from said first tetravalent element or mixture thereof and having, after calcination, the X-ray diffraction lines of Table II. The molecular sieve may contain a metal or metal ions (such as cobalt, copper, platinum, iron, chromium, manganese, nickel, zinc, lanthanum, palladium, rhodium or mixtures thereof) capable of catalyzing the reduction of the oxides of nitrogen, and the process may be conducted in the presence of a stoichiometric excess of oxygen. In one embodiment, the gas stream is the exhaust stream of an internal combustion engine.

The present invention also provides such a process wherein the molecular sieve has a mole ratio greater than about 15 of (1) silicon oxide to (2) an oxide selected from aluminum oxide, gallium oxide, iron oxide, boron oxide, titanium oxide, indium oxide and mixtures thereof.

## Partial Oxidation

In accordance with the present invention, there is provided a process for oxidation of hydrocarbons comprising contacting said hydrocarbon with an oxidizing agent in the presence of a catalytically effective amount of a titanium-containing molecular sieve for a time and at a temperature effective to oxidize said hydrocarbon, wherein the titanium-containing molecular sieve is a molecular sieve having a mole ratio greater than about 15 of (1) silicon oxide to (2) titanium oxide and having, after calcination, the X-ray diffraction lines of Table II.

1        There is further provided in accordance with this invention a process  
2        for epoxidation of an olefin comprising contacting said olefin with hydrogen  
3        peroxide in the presence of a catalytically effective amount of a titanium-  
4        containing molecular sieve for a time and at a temperature effective to  
5        epoxidize said olefin, wherein the titanium-containing molecular sieve is a  
6        molecular sieve having a mole ratio greater than about 15 of (1) silicon oxide  
7        to (2) titanium oxide and having, after calcination, the X-ray diffraction lines of  
8        Table II.

9  
10       Further provided in accordance with the present invention is a process  
11       for oxidizing cyclohexane comprising contacting said cyclohexane with  
12       hydrogen peroxide in the presence of a catalytically effective amount of a  
13       titanium-containing molecular sieve for a time and at a temperature effective  
14       to oxidize said cyclohexane, wherein the titanium-containing molecular sieve  
15       is a molecular sieve having a mole ratio greater than about 15 of (1) silicon  
16       oxide to (2) titanium oxide and having, after calcination, the X-ray diffraction  
17       lines of Table II.

18  
19       The present invention also provides a catalytic oxidation process  
20       comprising contacting under oxidation conditions (1) a reactant which is  
21       catalytically oxidizable in the presence of hydrogen peroxide, (2) aqueous  
22       hydrogen peroxide and (3) a catalytically effective amount of an oxidation  
23       catalyst comprising a molecular sieve having a mole ratio greater than about  
24       15 of (1) silicon oxide to (2) titanium oxide and having, after calcination, the X-  
25       ray diffraction lines of Table II.

26  
27       The present invention also provides a process for the epoxidation of an  
28       olefin comprising contacting said olefin with hydrogen peroxide in the  
29       presence of a catalytically effective amount of a catalyst comprising a  
30       molecular sieve having a mole ratio greater than about 15 of (1) silicon oxide  
31       to (2) titanium oxide and having, after calcination, the X-ray diffraction lines of  
32       Table II.

### Acylation

In accordance with the present invention, there is provided a method for performing an acylation reaction on an aromatic substrate  $\text{ArH}_n$  to form a product  $\text{ArH}_{n-1}\text{COR}$ , the method comprising the steps of:

- providing the aromatic substrate,
- intimately mixing the substrate and an acylating agent, wherein the acylating agent is selected from the group consisting of a carboxylic acid derivative, a carboxylic acid, an acid anhydride, an ester, and an acyl halide, and
- exposing an intimate mixture thus formed to a catalyst comprising a crystalline molecular sieve having a mole ratio greater than about 15 of (1) an oxide of a first tetravalent element to (2) an oxide of a trivalent element, pentavalent element, second tetravalent element which is different from said first tetravalent element or mixture thereof and having, after calcination, the X-ray diffraction lines of Table II.

The present invention also provides such a process wherein the molecular sieve has a mole ratio greater than about 15 of (1) silicon oxide to (2) an oxide selected from aluminum oxide, gallium oxide, iron oxide, boron oxide, titanium oxide, indium oxide and mixtures thereof.

The present invention also provides such a process wherein the molecular sieve has a mole ratio greater than about 15 of (1) silicon oxide to (2) an oxide selected from aluminum oxide, gallium oxide, iron oxide, boron oxide, titanium oxide, indium oxide and mixtures thereof.

### Oxygenate Conversion

The present invention relates to a process for the production of light olefins comprising olefins having from 2 to 4 carbon atoms per molecule from

1 an oxygenate feedstock. The process comprises passing the oxygenate  
2 feedstock to an oxygenate conversion zone containing a molecular sieve  
3 catalyst to produce a light olefin stream.

4  
5 Thus, in accordance with the present invention there is provided a  
6 process for the production of light olefins from a feedstock comprising an  
7 oxygenate or mixture of oxygenates, the process comprising reacting the  
8 feedstock at effective conditions over a catalyst comprising a crystalline  
9 molecular sieve having a mole ratio greater than about 15 of (1) an oxide of a  
10 first tetravalent element to (2) an oxide of a trivalent element, pentavalent  
11 element, second tetravalent element which is different from said first  
12 tetravalent element or mixture thereof and having, after calcination, the X-ray  
13 diffraction lines of Table II.

14  
15 The present invention also provides such a process wherein the  
16 molecular sieve has a mole ratio greater than about 15 of (1) silicon oxide to  
17 (2) an oxide selected from aluminum oxide, gallium oxide, iron oxide, boron  
18 oxide, titanium oxide, indium oxide and mixtures thereof.

#### 19 20 Gas Separation

21  
22 In accordance with the present invention there is provided a process  
23 for separating gasses comprising contacting a mixture of gasses with a  
24 membrane containing a molecular sieve wherein the molecular sieve is a  
25 crystalline molecular sieve having a mole ratio greater than about 15 of (1) an  
26 oxide of a first tetravalent element to (2) an oxide of a trivalent element,  
27 pentavalent element, second tetravalent element which is different from said  
28 first tetravalent element or mixture thereof and having, after calcination, the  
29 X-ray diffraction lines of Table II. The mixture of gasses may comprise carbon  
30 dioxide and methane.

1 the molecular sieve has a mole ratio greater than about 15 of (1) silicon oxide  
2 to (2) an oxide selected from aluminum oxide, gallium oxide, iron oxide, boron  
3 oxide, titanium oxide, indium oxide and mixtures thereof.

#### 4 5 Synthesis of Amines

6  
7 In accordance with the present invention there is provided a process  
8 for producing methylamine or dimethylamine comprising reacting methanol,  
9 dimethyl ether or a mixture thereof and ammonia in the gaseous phase in the  
10 presence of a catalyst comprising a crystalline molecular sieve having a mole  
11 ratio greater than about 15 of (1) an oxide of a first tetravalent element to (2)  
12 an oxide of a trivalent element, pentavalent element, second tetravalent  
13 element which is different from said first tetravalent element or mixture thereof  
14 and having, after calcination, the X-ray diffraction lines of Table II.

15  
16 The present invention also provides such a process wherein the  
17 molecular sieve has a mole ratio greater than about 15 of (1) silicon oxide to  
18 (2) an oxide selected from aluminum oxide, gallium oxide, iron oxide, boron  
19 oxide, titanium oxide, indium oxide and mixtures thereof.

#### 20 21 Treatment of Engine Exhaust (Cold Start Emissions)

22  
23 This invention generally relates to a process for treating an engine  
24 exhaust stream and in particular to a process for minimizing emissions during  
25 the cold start operation of an engine. Accordingly, the present invention  
26 provides a process for treating a cold-start engine exhaust gas stream  
27 containing hydrocarbons and other pollutants consisting of flowing said engine  
28 exhaust gas stream over a molecular sieve bed which preferentially adsorbs  
29 the hydrocarbons over water to provide a first exhaust stream, and flowing the  
30 first exhaust gas stream over a catalyst to convert any residual hydrocarbons  
31 and other pollutants contained in the first exhaust gas stream to innocuous  
32 products and provide a treated exhaust stream and discharging the treated  
33 exhaust stream into the atmosphere, the molecular sieve bed characterized in

1 that it comprises a crystalline molecular sieve having a mole ratio greater than  
2 about 15 of (1) an oxide of a first tetravalent element to (2) an oxide of a  
3 trivalent element, pentavalent element, second tetravalent element which is  
4 different from said first tetravalent element or mixture thereof and having, after  
5 calcination, the X-ray diffraction lines of Table II:

6  
7 Also provided in accordance with the present invention is such a  
8 process wherein the molecular sieve crystalline molecular sieve has a mole  
9 ratio greater than about 15 of (1) silicon oxide to (2) an oxide selected from  
10 aluminum oxide, gallium oxide, iron oxide, boron oxide, titanium oxide, indium  
11 oxide and mixtures thereof.

12  
13 The present invention further provides such a process wherein the  
14 engine is an internal combustion engine, including automobile engines, which  
15 can be fueled by a hydrocarbonaceous fuel.

16  
17 Also provided by the present invention is such a process wherein the  
18 molecular sieve has deposited on it a metal selected from the group  
19 consisting of platinum, palladium, rhodium, ruthenium, and mixtures thereof.

#### 20 21 Beckmann Rearrangement

22  
23 In accordance with the present invention there is provided a process  
24 for the preparation of amides from oximes via Beckmann rearrangement  
25 comprising contacting the oxime in the vapor phase with a catalyst comprising  
26 a crystalline molecular sieve having a mole ratio greater than about 15 of (1)  
27 an oxide of a first tetravalent element to (2) an oxide of a trivalent element,  
28 pentavalent element, second tetravalent element which is different from said  
29 first tetravalent element or mixture thereof and having, after calcination, the  
30 X-ray diffraction lines of Table II. The molecular sieve typically is acidic.

31  
32 The present invention also provides such a process wherein the  
33 crystalline molecular sieve has a mole ratio greater than about 15 of (1) silicon

oxide to (2) an oxide selected from aluminum oxide, gallium oxide, iron oxide, boron oxide, titanium oxide, indium oxide and mixtures thereof, and having, after calcination, the X-ray diffraction lines of Table II.

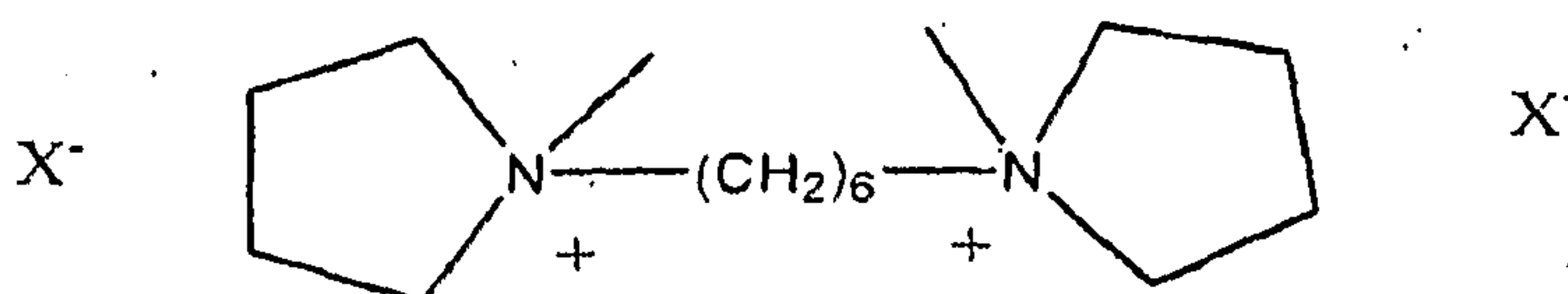
### BRIEF DESCRIPTION OF THE DRAWING

Figure 1 shows a comparison of two X-ray diffraction patterns, the top one being ZSM-5 and the bottom one being SSZ-74.

### DETAILED DESCRIPTION OF THE INVENTION

The present invention comprises a molecular sieve designated herein "molecular sieve SSZ-74" or simply "SSZ-74".

In preparing SSZ-74, a hexamethylene-1,6-bis-(N-methyl-N-pyrrolidinium) dication is used as a structure directing agent ("SDA"), also known as a crystallization template. The SDA useful for making SSZ-74 has the following structure:



Hexamethylene-1,6-bis-(N-methyl-N-pyrrolidinium) dication

The SDA dication is associated with anions ( $X^-$ ) which may be any anion that is not detrimental to the formation of the SSZ-74. Representative anions include halogen, e.g., fluoride, chloride, bromide and iodide, hydroxide, acetate, sulfate, tetrafluoroborate, carboxylate, and the like. Hydroxide is a typical anion, since the structure directing agent (SDA) may be used to provide hydroxide ion. Thus, it is beneficial to ion exchange, for example, a halide to hydroxide ion.

In general, SSZ-74 is prepared by contacting (1) an active source(s) of silicon oxide, and, optionally, (2) an active source(s) of aluminum oxide, gallium oxide, iron oxide, boron oxide, titanium oxide, indium oxide and mixtures thereof with the hexamethylene-1,6-bis-(N-methyl-N-pyrrolidinium) dication SDA in the presence of fluoride ion.

SSZ-74 is prepared from a reaction mixture comprising, in terms of mole ratios, the following:

TABLE A

Reaction Mixture

|                                       | Embodiment 1    | Embodiment 2 |
|---------------------------------------|-----------------|--------------|
| $\text{SiO}_2 / \text{X}_a\text{O}_b$ | 100 and greater |              |
| $\text{OH}^- / \text{SiO}_2$          | 0.20 – 0.80     | 0.40 – 0.60  |
| $\text{Q} / \text{SiO}_2$             | 0.20 – 0.80     | 0.40 – 0.60  |
| $\text{M}_{2/n} / \text{SiO}_2$       | 0 – 0.04        | 0 – 0.025    |
| $\text{H}_2\text{O} / \text{SiO}_2$   | 2 – 10          | 3 – 7        |
| $\text{HF} / \text{SiO}_2$            | 0.20 – 0.80     | 0.30 – 0.60  |

where X is aluminum, gallium, iron, boron, titanium, indium and mixtures thereof, a is 1 or 2, b is 2 when a is 1 (i.e., W is tetravalent); b is 3 when a is 2 (i.e., W is trivalent), M is an alkali metal cation, alkaline earth metal cation or mixtures thereof; n is the valence of M (i.e., 1 or 2); Q is a hexamethylene-1,6-bis-(N-methyl-N-pyrrolidinium) dication and F is fluoride.

As noted above, the  $\text{SiO}_2 / \text{X}_a\text{O}_b$  mole ratio in the reaction mixture is 100 and greater. This means that the  $\text{SiO}_2 / \text{X}_a\text{O}_b$  mole ratio can be infinity, i.e., there is no  $\text{X}_a\text{O}_b$  in the reaction mixture. This results in a version of SSZ-74 that is essentially all silica. As used herein, "essentially all silicon oxide" or "essentially all-silica" means that the molecular sieve's crystal structure is comprised of only silicon oxide or is comprised of silicon oxide and only trace amounts of other oxides, such as aluminum oxide, which may be introduced as impurities in the source of silicon oxide.

1           An example of the source of silicon oxide is tetraethyl orthosilicate. An  
2           example of the source of aluminum oxide is LZ-210 zeolite (a type of Y  
3           zeolite).

4  
5           In practice, SSZ-74 is prepared by a process comprising:

- 6           (a)     preparing an aqueous solution containing (1) a source(s) of  
7                   silicon oxide, (2) a source(s) of aluminum oxide, gallium oxide,  
8                   iron oxide, boron oxide, titanium oxide, indium oxide and  
9                   mixtures thereof, (3) a source of fluoride ion and (4) a  
10                  hexamethylene-1,6-bis-(N-methyl-N-pyrrolidinium) dication  
11                  having an anionic counterion which is not detrimental to the  
12                  formation of SSZ-74;  
13           (b)     maintaining the aqueous solution under conditions sufficient to  
14                   form crystals of SSZ-74; and  
15           (c)     recovering the crystals of SSZ-74.

16  
17           The reaction mixture is maintained at an elevated temperature until the  
18           crystals of the SSZ-74 are formed. The hydrothermal crystallization is usually  
19           conducted under autogenous pressure, at a temperature between 100°C and  
20           200°C, for example between 135°C and 180°C. The crystallization period is  
21           typically greater than 1 day, for example from about 3 days to about 20 days.  
22           The molecular sieve may be prepared using mild stirring or agitation.

23  
24           During the hydrothermal crystallization step, the SSZ-74 crystals can  
25           be allowed to nucleate spontaneously from the reaction mixture. The use of  
26           SSZ-74 crystals as seed material can be advantageous in decreasing the time  
27           necessary for complete crystallization to occur. In addition, seeding can lead  
28           to an increased purity of the product obtained by promoting the nucleation  
29           and/or formation of SSZ-74 over any undesired phases. When used as seeds,  
30           SSZ-74 crystals are added in an amount between 0.1 and 10% of the weight  
31           of the first tetravalent element oxide, e.g. silica, used in the reaction mixture.

Once the molecular sieve crystals have formed, the solid product is separated from the reaction mixture by standard mechanical separation techniques such as filtration. The crystals are water-washed and then dried, e.g., at 90°C to 150°C for from 8 to 24 hours, to obtain the as-synthesized SSZ-74 crystals. The drying step can be performed at atmospheric pressure or under vacuum.

SSZ-74 as prepared has the X-ray diffraction lines of Table I below. SSZ-74 has a composition, as synthesized (i.e., prior to removal of the SDA from the SSZ-74) and in the anhydrous state, comprising the following (in terms of mole ratios):

|                                       |                  |
|---------------------------------------|------------------|
| $\text{SiO}_2 / \text{X}_c\text{O}_d$ | greater than 100 |
| $\text{M}_{2/n} / \text{SiO}_2$       | 0 – 0.03         |
| $\text{Q} / \text{SiO}_2$             | 0.30 – 0.70      |
| $\text{F} / \text{SiO}_2$             | 0.30 – 0.70      |

wherein X is aluminum, gallium, iron, boron, titanium, indium and mixtures thereof, c is 1 or 2; d is 2 when c is 1 (i.e., W is tetravalent) or d is 3 or 5 when c is 2 (i.e., d is 3 when W is trivalent or 5 when W is pentavalent), M is an alkali metal cation, alkaline earth metal cation or mixtures thereof; n is the valence of M (i.e., 1 or 2); Q is a hexamethylene-1,6-bis-(N-methyl-N-pyrrolidinium) dication and F is fluoride.

SSZ-74 is characterized by its X-ray diffraction pattern. SSZ-74, as-synthesized, has a crystalline structure whose X-ray powder diffraction pattern exhibits the characteristic lines shown in Table I.

TABLE I

As-Synthesized SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)<sup>(b)</sup></u> |
|------------------------------|------------------------------|--------------------------------------------------------|
|------------------------------|------------------------------|--------------------------------------------------------|

7.95

11.11

W.

|       |       |     |
|-------|-------|-----|
| 8.68  | 10.18 | M   |
| 8.85  | 9.98  | W-M |
| 9.02  | 9.80  | W   |
| 22.69 | 3.92  | W-M |
| 23.14 | 3.84  | VS  |
| 24.01 | 3.70  | M   |
| 24.52 | 3.63  | W   |
| 24.93 | 3.57  | W   |
| 29.95 | 2.98  | W   |

(a)  $\pm 0.1$

(b) The X-ray patterns provided are based on a relative intensity scale in which the strongest line in the X-ray pattern is assigned a value of 100: W(weak) is less than 20; M(medium) is between 20 and 40; S(strong) is between 40 and 60; VS(very strong) is greater than 60.

Table IA below shows the X-ray powder diffraction lines for as-synthesized SSZ-74 including actual relative intensities.

TABLE IA

As-Synthesized SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Intensity</u> |
|------------------------------|------------------------------|------------------|
| 7.95                         | 11.11                        | 7.9              |
| 8.68                         | 10.18                        | 21.1             |
| 8.85                         | 9.98                         | 18.7             |
| 9.02                         | 9.80                         | 11.3             |
| 11.30                        | 7.82                         | 0.4              |
| 12.70                        | 6.96                         | 1.8              |
| 13.98                        | 6.33                         | 2.4              |
| 14.77                        | 5.99                         | 0.5              |
| 14.85                        | 5.96                         | 2.1              |
| 15.93                        | 5.56                         | 6.3              |
| 16.30                        | 5.43                         | 4.6              |
| 16.50                        | 5.37                         | 1.8              |
| 17.05                        | 5.20                         | 0.8              |
| 17.41                        | 5.09                         | 0.1              |
| 17.71                        | 5.00                         | 2.0              |
| 18.09                        | 4.90                         | 7.4              |
| 18.38                        | 4.82                         | 0.7              |
| 18.89                        | 4.69                         | 0.9              |
| 18.96                        | 4.68                         | 4.4              |
| 19.69                        | 4.51                         | 1.8              |
| 20.39                        | 4.35                         | 5.1              |
| 20.63                        | 4.30                         | 4.2              |

|       |       |       |     |
|-------|-------|-------|-----|
|       | 21.12 | 4.20  | 7.7 |
|       | 21.55 | 4.12  | 5.4 |
|       | 21.75 | 4.08  | 0.5 |
|       | 21.80 | 4.07  | 1.4 |
|       | 21.88 | 4.06  | 2.1 |
|       | 21.96 | 4.04  | 1.5 |
|       | 22.17 | 4.01  | 0.8 |
| 22.69 | 3.92  | 18.9  |     |
| 23.14 | 3.84  | 100.0 |     |
| 23.89 | 3.72  | 9.4   |     |
| 24.01 | 3.70  | 25.6  |     |
| 24.52 | 3.63  | 13.7  |     |
| 24.68 | 3.60  | 2.1   |     |
| 24.93 | 3.57  | 11.3  |     |
| 25.09 | 3.55  | 0.9   |     |
| 25.37 | 3.51  | 1.7   |     |
| 25.57 | 3.48  | 2.7   |     |
| 26.20 | 3.40  | 5.5   |     |
| 26.31 | 3.38  | 0.8   |     |
| 26.67 | 3.34  | 2.0   |     |
| 26.76 | 3.33  | 1.0   |     |
| 26.82 | 3.32  | 0.9   |     |
| 27.01 | 3.30  | 3.4   |     |
| 27.05 | 3.29  | 0.8   |     |
| 27.48 | 3.24  | 0.8   |     |
| 27.99 | 3.19  | 4.2   |     |
| 28.18 | 3.16  | 0.8   |     |
| 28.78 | 3.10  | 0.6   |     |
| 29.03 | 3.07  | 0.7   |     |
| 29.31 | 3.04  | 0.9   |     |
| 29.58 | 3.02  | 2.4   |     |
| 29.95 | 2.98  | 9.6   |     |
| 30.44 | 2.93  | 3.7   |     |
| 31.09 | 2.87  | 3.1   |     |
| 31.36 | 2.85  | 0.8   |     |
| 31.98 | 2.80  | 2.2   |     |
| 32.23 | 2.78  | 1.7   |     |
| 32.37 | 2.76  | 0.6   |     |
| 32.64 | 2.74  | 1.5   |     |
| 33.03 | 2.71  | 0.1   |     |
| 33.34 | 2.69  | 1.0   |     |
| 33.47 | 2.68  | 1.3   |     |
| 34.08 | 2.63  | 0.7   |     |
| 34.55 | 2.59  | 1.8   |     |
| 34.73 | 2.58  | 0.4   |     |

1

(a)  $\pm 0.1$ 

2

After calcination, the X-ray powder diffraction pattern for SSZ-74 exhibits the characteristic lines shown in Table II below.

TABLE II

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |

<sup>(a)</sup> ± 0.1

Table IIA below shows the X-ray powder diffraction lines for calcined SSZ-74 including actual relative intensities.

TABLE IIA

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | 34.9                                     |
| 8.70                         | 10.16                        | 86.8                                     |
| 8.89                         | 9.93                         | 40.2                                     |
| 9.08                         | 9.74                         | 47.0                                     |
| 9.66                         | 9.15                         | 1.0                                      |
| 11.26                        | 7.85                         | 0.4                                      |
| 11.34                        | 7.80                         | 0.5                                      |
| 12.76                        | 6.93                         | 1.1                                      |
| 13.26                        | 6.67                         | 4.6                                      |
| 14.02                        | 6.31                         | 13.4                                     |
| 14.93                        | 5.93                         | 20.9                                     |
| 16.03                        | 5.52                         | 23.5                                     |
| 16.39                        | 5.40                         | 4.3                                      |
| 16.61                        | 5.33                         | 4.4                                      |
| 17.12                        | 5.18                         | 3.0                                      |
| 17.80                        | 4.98                         | 2.8                                      |

|       |      |       |
|-------|------|-------|
| 18.19 | 4.87 | 7.6   |
| 19.05 | 4.66 | 1.9   |
| 19.74 | 4.49 | 0.4   |
| 20.44 | 4.34 | 3.0   |
| 20.75 | 4.28 | 3.4   |
| 21.19 | 4.19 | 7.7   |
| 21.67 | 4.10 | 4.1   |
| 21.99 | 4.04 | 5.8   |
| 22.68 | 3.92 | 3.7   |
| 22.79 | 3.90 | 9.5   |
| 23.26 | 3.82 | 100.0 |
| 23.95 | 3.71 | 14.2  |

(a)  $\pm 0.1$

The X-ray powder diffraction patterns were determined by standard techniques. The radiation was the K-alpha/doublet of copper. The peak heights and the positions, as a function of  $2\theta$  where  $\theta$  is the Bragg angle, were read from the relative intensities of the peaks, and  $d$ , the interplanar spacing in Angstroms corresponding to the recorded lines, can be calculated.

The variation in the scattering angle (two theta) measurements, due to instrument error and to differences between individual samples, is estimated at  $\pm 0.1$  degrees.

Representative peaks from the X-ray diffraction pattern of calcined SSZ-74 are shown in Table II. Calcination can result in changes in the intensities of the peaks as compared to patterns of the "as-made" material, as well as minor shifts in the diffraction pattern.

Crystalline SSZ-74 can be used as-synthesized, but typically will be thermally treated (calcined). Usually, it is desirable to remove the alkali metal cation (if any) by ion exchange and replace it with hydrogen, ammonium, or any desired metal ion.

SSZ-74 can be formed into a wide variety of physical shapes. Generally speaking, the molecular sieve can be in the form of a powder, a

1 granule, or a molded product, such as extrudate having a particle size  
2 sufficient to pass through a 2-mesh (Tyler) screen and be retained on a  
3 400-mesh (Tyler) screen. In cases where the catalyst is molded, such as by  
4 extrusion with an organic binder, the SSZ-74 can be extruded before drying,  
5 or, dried or partially dried and then extruded.

6  
7 SSZ-74 can be composited with other materials resistant to the  
8 temperatures and other conditions employed in organic conversion  
9 processes. Such matrix materials include active and inactive materials and  
10 synthetic or naturally occurring zeolites as well as inorganic materials such as  
11 clays, silica and metal oxides. Examples of such materials and the manner in  
12 which they can be used are disclosed in U.S. Patent No. 4,910,006, issued  
13 May 20, 1990 to Zones et al., and U.S. Patent No. 5,316,753, issued May 31,  
14 1994 to Nakagawa.

#### 15 16 Hydrocarbon Conversion Processes

17  
18 SSZ-74 molecular sieves are useful in hydrocarbon conversion  
19 reactions. Hydrocarbon conversion reactions are chemical and catalytic  
20 processes in which carbon containing compounds are changed to different  
21 carbon containing compounds. Examples of hydrocarbon conversion  
22 reactions in which SSZ-74 is expected to be useful include hydrocracking,  
23 dewaxing, catalytic cracking and olefin and aromatics formation reactions.  
24 The catalysts are also expected to be useful in other petroleum refining and  
25 hydrocarbon conversion reactions such as isomerizing n-paraffins and  
26 naphthenes, polymerizing and oligomerizing olefinic or acetylenic compounds  
27 such as isobutylene and butene-1, polymerization of 1-olefins (e.g., ethylene),  
28 reforming, isomerizing polyalkyl substituted aromatics (e.g., m-xylene), and  
29 disproportionating aromatics (e.g., toluene) to provide mixtures of benzene,  
30 xylenes and higher methylbenzenes and oxidation reactions. Also included  
31 are rearrangement reactions to make various naphthalene derivatives, and

1 forming higher molecular weight hydrocarbons from lower molecular weight  
2 hydrocarbons (e.g., methane upgrading).

3  
4 The SSZ-74 catalysts may have high selectivity, and under  
5 hydrocarbon conversion conditions can provide a high percentage of desired  
6 products relative to total products.

7  
8 For high catalytic activity, the SSZ-74 molecular sieve should be  
9 predominantly in its hydrogen ion form. Generally, the molecular sieve is  
10 converted to its hydrogen form by ammonium exchange followed by  
11 calcination. If the molecular sieve is synthesized with a high enough ratio of  
12 SDA cation to sodium ion, calcination alone may be sufficient. Typically, after  
13 calcination at least 80% of the cation sites are occupied by hydrogen ions  
14 and/or rare earth ions. As used herein, "predominantly in the hydrogen form"  
15 means that, after calcination, at least 80% of the cation sites are occupied by  
16 hydrogen ions and/or rare earth ions.

17  
18 SSZ-74 molecular sieves can be used in processing  
19 hydrocarbonaceous feedstocks. Hydrocarbonaceous feedstocks contain  
20 carbon compounds and can be from many different sources, such as virgin  
21 petroleum fractions, recycle petroleum fractions, shale oil, liquefied coal, tar  
22 sand oil, synthetic paraffins from NAO, recycled plastic feedstocks. Other  
23 feeds include synthetic feeds, such as those derived from a Fischer Tropsch  
24 process, including an oxygenate-containing Fischer Tropsch process boiling  
25 below about 371°C (700°F). In general, the feed can be any carbon containing  
26 feedstock susceptible to zeolitic catalytic reactions. Depending on the type of  
27 processing the hydrocarbonaceous feed is to undergo, the feed can contain  
28 metal or be free of metals, it can also have high or low nitrogen or sulfur  
29 impurities. It can be appreciated, however, that in general processing will be  
30 more efficient (and the catalyst more active) the lower the metal, nitrogen, and  
31 sulfur content of the feedstock.

32

1           The conversion of hydrocarbonaceous feeds can take place in any  
2 convenient mode, for example, in fluidized bed, moving bed, or fixed bed  
3 reactors depending on the types of process desired. The formulation of the  
4 catalyst particles will vary depending on the conversion process and method  
5 of operation.

6  
7           Other reactions which can be performed using the catalyst of this  
8 invention containing a metal, e.g., a Group VIII metal such platinum, include  
9 hydrogenation-dehydrogenation reactions, denitrogenation and desulfurization  
10 reactions.

11  
12           The following table indicates typical reaction conditions which may be  
13 employed when using catalysts comprising SSZ-74 in the hydrocarbon  
14 conversion reactions of this invention. Typical conditions are indicated in  
15 parentheses.

| Process                     | Temp., °C                                                             | Pressure                                                                      | LHSV                                                                 |
|-----------------------------|-----------------------------------------------------------------------|-------------------------------------------------------------------------------|----------------------------------------------------------------------|
| Hydrocracking               | 175-485                                                               | 0.5-350 bar                                                                   | 0.1-30                                                               |
| Dewaxing                    | 200-475<br>(250-450)                                                  | 15-3000 psig,<br>0.103-20.7 Mpa gauge<br>(200-3000, 1.38-20.7<br>Mpa gauge)   | 0.1-20<br>(0.2-10)                                                   |
| Aromatics<br>formation      | 400-600<br>(480-550)                                                  | atm.-10 bar                                                                   | 0.1-15                                                               |
| Cat. Cracking               | 127-885                                                               | subatm. <sup>1</sup><br>(atm.-5 atm.)                                         | 0.5-50                                                               |
| Oligomerization             | 232-649 <sup>2</sup><br>10-232 <sup>4</sup><br>(27-204) <sup>4</sup>  | 0.1-50 atm. <sup>2,3</sup><br>-<br>-                                          | 0.2-50 <sup>2</sup><br>0.05-20 <sup>5</sup><br>(0.1-10) <sup>5</sup> |
| Paraffins to<br>aromatics   | 100-700                                                               | 0-1000 psig                                                                   | 0.5-40 <sup>5</sup>                                                  |
| Condensation of<br>alcohols | 260-538                                                               | 0.5-1000 psig,<br>0.00345-6.89 Mpa<br>gauge                                   | 0.5-50 <sup>5</sup>                                                  |
| Isomerization               | 93-538<br>(204-315)                                                   | 50-1000 psig, 0.345-<br>6.89 Mpa gauge                                        | 1-10<br>(1-4)                                                        |
| Xylene<br>isomerization     | 260-593 <sup>2</sup><br>(315-566) <sup>2</sup><br>38-371 <sup>4</sup> | 0.5-50 atm. <sup>2</sup><br>(1-5 atm) <sup>2</sup><br>1-200 atm. <sup>4</sup> | 0.1-100 <sup>5</sup><br>(0.5-50) <sup>5</sup><br>0.5-50              |

1

2 <sup>1</sup> Several hundred atmospheres3 <sup>2</sup> Gas phase reaction4 <sup>3</sup> Hydrocarbon partial pressure5 <sup>4</sup> Liquid phase reaction6 <sup>5</sup> WHSV

7 Other reaction conditions and parameters are provided below.

8

### Hydrocracking

Using a catalyst which comprises SSZ-74, for example predominantly in the hydrogen form, and a hydrogenation promoter, heavy petroleum residual feedstocks, cyclic stocks and other hydrocrackate charge stocks can be hydrocracked using the process conditions and catalyst components disclosed in the aforementioned U.S. Patent No. 4,910,006 and U.S. Patent No. 5,316,753.

The hydrocracking catalysts contain an effective amount of at least one hydrogenation component of the type commonly employed in hydrocracking catalysts. The hydrogenation component is generally selected from the group of hydrogenation catalysts consisting of one or more metals of Group VIB and Group VIII, including the salts, complexes and solutions containing such. The hydrogenation catalyst may be selected from the group of metals, salts and complexes thereof of the group consisting of at least one of platinum, palladium, rhodium, iridium, ruthenium and mixtures thereof or the group consisting of at least one of nickel, molybdenum, cobalt, tungsten, titanium, chromium and mixtures thereof. Reference to the catalytically active metal or metals is intended to encompass such metal or metals in the elemental state or in some form such as an oxide, sulfide, halide, carboxylate and the like. The hydrogenation catalyst is present in an effective amount to provide the hydrogenation function of the hydrocracking catalyst, for example in the range of from 0.05 to 25% by weight.

### Dewaxing

SSZ-74, for example predominantly in the hydrogen form, can be used to dewax hydrocarbonaceous feeds by selectively removing straight chain paraffins. Typically, the viscosity index of the dewaxed product is improved (compared to the waxy feed) when the waxy feed is contacted with SSZ-74 under isomerization dewaxing conditions.

1           The catalytic dewaxing conditions are dependent in large measure on  
2 the feed used and upon the desired pour point. Hydrogen is typically present  
3 in the reaction zone during the catalytic dewaxing process. The hydrogen to  
4 feed ratio is typically between about 500 and about 30,000 SCF/bbl (standard  
5 cubic feet per barrel) (0.089 to 5.34 SCM/liter (standard cubic meters/liter)),  
6 for example about 1000 to about 20,000 SCF/bbl (0.178 to 3.56 SCM/liter).  
7 Generally, hydrogen will be separated from the product and recycled to the  
8 reaction zone. Typical feedstocks include light gas oil, heavy gas oils and  
9 reduced crudes boiling above about 350°F (177°C).

10  
11           A typical dewaxing process is the catalytic dewaxing of a hydrocarbon  
12 oil feedstock boiling above about 350°F (177°C) and containing straight chain  
13 and slightly branched chain hydrocarbons by contacting the hydrocarbon oil  
14 feedstock in the presence of added hydrogen gas at a hydrogen pressure of  
15 about 15-3000 psi (0.103-20.7 Mpa) with a catalyst comprising SSZ-74 and at  
16 least one Group VIII metal.

17  
18           The SSZ-74 hydrodewaxing catalyst may optionally contain a  
19 hydrogenation component of the type commonly employed in dewaxing  
20 catalysts. See the aforementioned U.S. Patent No. 4,910,006 and U.S. Patent  
21 No. 5,316,753 for examples of these hydrogenation components.

22  
23           The hydrogenation component is present in an effective amount to  
24 provide an effective hydrodewaxing and hydroisomerization catalyst for  
25 example in the range of from about 0.05 to 5% by weight. The catalyst may be  
26 run in such a mode to increase isomerization dewaxing at the expense of  
27 cracking reactions.

28  
29           The feed may be hydrocracked, followed by dewaxing. This type of two  
30 stage process and typical hydrocracking conditions are described in U.S.  
31 Patent No. 4,921,594, issued May 1, 1990 to Miller.

1 SSZ-74 may also be utilized as a dewaxing catalyst in the form of a  
2 combination of catalysts. The combination comprises a first catalyst  
3 comprising molecular sieve SSZ-74 and, desirably, at least one Group VIII  
4 metal, and a second catalyst comprising an aluminosilicate zeolite which is  
5 more shape selective than molecular sieve SSZ-74. As used herein, the term  
6 "combination" includes mixtures of the molecular sieve of this invention and  
7 the aluminosilicate zeolite, layers of the molecular sieve and zeolite, or any  
8 other configuration in which the feed comes in contact with both the molecular  
9 sieve and the zeolite. The use of combined catalysts in the form of layers is  
10 disclosed in U.S. Patent No. 5,149,421, issued September 22, 1992 to Miller.  
11 The layering may also include a bed of SSZ-74 layered with a non-zeolitic  
12 component designed for either hydrocracking or hydrofinishing.

13  
14 SSZ-74 may also be used to dewax raffinates, including bright stock,  
15 under conditions such as those disclosed in U. S. Patent No. 4,181,598,  
16 issued January 1, 1980 to Gillespie et al.

17  
18 It is often desirable to use mild hydrogenation (sometimes referred to  
19 as hydrofinishing) to produce more stable dewaxed products. The  
20 hydrofinishing step can be performed either before or after the dewaxing step,  
21 typically after. Hydrofinishing is typically conducted at temperatures ranging  
22 from about 190°C to about 340°C at pressures from about 400 psig to about  
23 3000 psig (2.76 to 20.7 Mpa gauge) at space velocities (LHSV) between  
24 about 0.1 and 20 and a hydrogen recycle rate of about 400 to 1500 SCF/bbl  
25 (0.071 to 0.27 SCM/liter). The hydrogenation catalyst employed must be  
26 active enough not only to hydrogenate the olefins, diolefins and color bodies  
27 which may be present, but also to reduce the aromatic content. Suitable  
28 hydrogenation catalyst are disclosed in U. S. Patent No. 4,921,594, issued  
29 May 1, 1990 to Miller. The hydrofinishing step is beneficial in preparing an  
30 acceptably stable product (e.g., a lubricating oil) since dewaxed products  
31 prepared from hydrocracked

1 stocks tend to be unstable to air and light and tend to form sludges  
2 spontaneously and quickly.

3  
4 Lube oil may be prepared using SSZ-74. For example, a C<sub>20+</sub> lube oil may  
5 be made by isomerizing a C<sub>20+</sub> olefin feed over a catalyst comprising SSZ-74  
6 in the hydrogen form and at least one Group VIII metal. Alternatively, the  
7 lubricating oil may be made by hydrocracking in a hydrocracking zone a  
8 hydrocarbonaceous feedstock to obtain an effluent comprising a  
9 hydrocracked oil, and catalytically dewaxing the effluent at a temperature of at  
10 least about 400°F (204°C) and at a pressure of from about 15 psig to about  
11 3000 psig (0.103-20.7 Mpa gauge) in the presence of added hydrogen gas  
12 with a catalyst comprising SSZ-74 in the hydrogen form and at least one  
13 Group VIII metal.

#### 14 15 Aromatics Formation

16  
17 SSZ-74 can be used to convert light straight run naphthas and similar  
18 mixtures to highly aromatic mixtures. Thus, normal and slightly branched  
19 chained hydrocarbons, for example those having a boiling range above about  
20 40°C and less than about 200°C, can be converted to products having a  
21 substantial higher octane aromatics content by contacting the hydrocarbon  
22 feed with a catalyst comprising SSZ-74. It is also possible to convert heavier  
23 feeds into BTX or naphthalene derivatives of value using a catalyst  
24 comprising SSZ-74.

25  
26 The conversion catalyst typically contains a Group VIII metal  
27 compound to have sufficient activity for commercial use. By Group VIII metal  
28 compound as used herein is meant the metal itself or a compound thereof.  
29 The Group VIII noble metals and their compounds, platinum, palladium, and  
30 iridium, or combinations thereof can be used. Rhenium or tin or a mixture  
31 thereof may also be used in conjunction with the Group VIII metal compound  
32 (typically a noble metal compound), for example a platinum compound. The  
33 amount of Group VIII metal present in the conversion catalyst should be within

1 the normal range of use in reforming catalysts, from about 0.05 to 2.0 weight  
2 percent, for example 0.2 to 0.8 weight percent.

3  
4 It is critical to the selective production of aromatics in useful quantities  
5 that the conversion catalyst be substantially free of acidity, for example, by  
6 neutralizing the molecular sieve with a basic metal, e.g., alkali metal,  
7 compound. Methods for rendering the catalyst free of acidity are known in the  
8 art. See the aforementioned U.S. Patent No. 4,910,006 and U.S. Patent  
9 No. 5,316,753 for a description of such methods.

10  
11 Typical alkali metals are sodium, potassium, rubidium and cesium. The  
12 molecular sieve itself can be substantially free of acidity only at very high  
13 silica:alumina mole ratios.

#### 14 15 Catalytic Cracking

16  
17 Hydrocarbon cracking stocks can be catalytically cracked in the  
18 absence of hydrogen using SSZ-74, for example predominantly in the  
19 hydrogen form.

20  
21 When SSZ-74 is used as a catalytic cracking catalyst in the absence of  
22 hydrogen, the catalyst may be employed in conjunction with traditional  
23 cracking catalysts, e.g., any aluminosilicate heretofore employed as a  
24 component in cracking catalysts. Typically, these are large pore, crystalline  
25 aluminosilicates. Examples of these traditional cracking catalysts are  
26 disclosed in the aforementioned U.S. Patent No. 4,910,006 and U.S. Patent  
27 No 5,316,753. When a traditional cracking catalyst (TC) component is  
28 employed, the relative weight ratio of the TC to the SSZ-74 is generally  
29 between about 1:10 and about 500:1, desirably between about 1:10 and  
30 about 200:1, for example between about 1:2 and about 50:1 or between about  
31 1:1 and about 20:1. The novel molecular sieve and/or the traditional cracking  
32 component may be further ion exchanged with rare earth ions to modify  
33 selectivity.

1  
2 The cracking catalysts are typically employed with an inorganic oxide  
3 matrix component. See the aforementioned U.S. Patent No. 4,910,006 and  
4 U.S. Patent No. 5,316,753 for examples of such matrix components.

5  
6 Isomerization

7  
8 The present catalyst is highly active and highly selective for isomerizing  
9 C<sub>4</sub> to C<sub>7</sub> hydrocarbons. The activity means that the catalyst can operate at  
10 relatively low temperature which thermodynamically favors highly branched  
11 paraffins. Consequently, the catalyst can produce a high octane product. The  
12 high selectivity means that a relatively high liquid yield can be achieved when  
13 the catalyst is run at a high octane.

14  
15 The present process comprises contacting the isomerization catalyst,  
16 i.e., a catalyst comprising SSZ-74 in the hydrogen form, with a hydrocarbon  
17 feed under isomerization conditions. The feed is typically a light straight run  
18 fraction, boiling within the range of 30°F to 250°F (-1°C to 121°C), for example  
19 from 60°F to 200°F (16°C to 93°C). Typically, the hydrocarbon feed for the  
20 process comprises a substantial amount of C<sub>4</sub> to C<sub>7</sub> normal and slightly  
21 branched low octane hydrocarbons, for example C<sub>5</sub> and C<sub>6</sub> hydrocarbons.

22  
23 The isomerization reaction is typically carried out in the presence of  
24 hydrogen. Hydrogen may be added to give a hydrogen to hydrocarbon ratio  
25 (H<sub>2</sub>/HC) of between 0.5 and 10 H<sub>2</sub>/HC, for example between 1 and 8 H<sub>2</sub>/HC.  
26 See the aforementioned U.S. Patent No. 4,910,006 and U.S. Patent No.  
27 5,316,753 for a further discussion of isomerization process conditions.

28  
29 A low sulfur feed is especially useful in the present process. The feed  
30 desirably contains less than 10 ppm, for example less than 1 ppm or less than  
31 0.1 ppm sulfur. In the case of a feed which is not already low in sulfur,  
32 acceptable levels can be reached by hydrogenating the feed in a  
33 presaturation zone with a hydrogenating catalyst which is resistant to sulfur

1 poisoning. See the aforementioned U.S. Patent No. 4,910,006 and U.S.  
2 Patent No. 5,316,753 for a further discussion of this hydrodesulfurization  
3 process.

4  
5 It is typical to limit the nitrogen level and the water content of the feed.  
6 Catalysts and processes which are suitable for these purposes are known to  
7 those skilled in the art.

8  
9 After a period of operation, the catalyst can become deactivated by  
10 sulfur or coke. See the aforementioned U.S. Patent No. 4,910,006 and U.S.  
11 Patent No. 5,316,753 for a further discussion of methods of removing this  
12 sulfur and coke, and of regenerating the catalyst.

13  
14 The conversion catalyst desirably contains a Group VIII metal  
15 compound to have sufficient activity for commercial use. By Group VIII metal  
16 compound as used herein is meant the metal itself or a compound thereof.  
17 The Group VIII noble metals and their compounds, platinum, palladium, and  
18 iridium, or combinations thereof can be used. Rhenium and tin may also be  
19 used in conjunction with the noble metal. Typically, the metal is platinum. The  
20 amount of Group VIII metal present in the conversion catalyst should be within  
21 the normal range of use in isomerizing catalysts, from about 0.05 to  
22 2.0 weight percent, for example 0.2 to 0.8 weight percent.

#### 23 24 Alkylation and Transalkylation

25  
26 SSZ-74 can be used in a process for the alkylation or transalkylation of  
27 an aromatic hydrocarbon. The process comprises contacting the aromatic  
28 hydrocarbon with a C<sub>2</sub> to C<sub>16</sub> olefin alkylating agent or a polyalkyl aromatic  
29 hydrocarbon transalkylating agent, under at least partial liquid phase  
30 conditions, and in the presence of a catalyst comprising SSZ-74.

1 SSZ-74 can also be used for removing benzene from gasoline by  
2 alkylating the benzene as described above and removing the alkylated  
3 product from the gasoline.  
4

5 For high catalytic activity, the SSZ-74 molecular sieve should be  
6 predominantly in its hydrogen ion form. It is typical that, after calcination, at  
7 least 80% of the cation sites are occupied by hydrogen ions and/or rare earth  
8 ions.  
9

10 Examples of suitable aromatic hydrocarbon feedstocks which may be  
11 alkylated or transalkylated by the process of the invention include aromatic  
12 compounds such as benzene, toluene and xylene. Benzene is especially  
13 useful. There may be occasions where naphthalene or naphthalene  
14 derivatives such as dimethylnaphthalene may be desirable. Mixtures of  
15 aromatic hydrocarbons may also be employed.  
16

17 Suitable olefins for the alkylation of the aromatic hydrocarbon are those  
18 containing 2 to 20, for example 2 to 4, carbon atoms, such as ethylene,  
19 propylene, butene-1, trans-butene-2 and cis-butene-2, or mixtures thereof.  
20 There may be instances where pentenes are desirable. Typical olefins are  
21 ethylene and propylene. Longer chain alpha olefins may be used as well.  
22

23 When transalkylation is desired, the transalkylating agent is a polyalkyl  
24 aromatic hydrocarbon containing two or more alkyl groups that each may  
25 have from 2 to about 4 carbon atoms. For example, suitable polyalkyl  
26 aromatic hydrocarbons include di-, tri- and tetra-alkyl aromatic hydrocarbons,  
27 such as diethylbenzene, triethylbenzene, diethylmethylbenzene  
28 (diethyltoluene), di-isopropylbenzene, di-isopropyltoluene, dibutylbenzene,  
29 and the like. Typical polyalkyl aromatic hydrocarbons are the dialkyl  
30 benzenes. A particularly desirable polyalkyl aromatic hydrocarbon is  
31 di-isopropylbenzene.  
32

1           When alkylation is the process conducted, reaction conditions are as  
2 follows. The aromatic hydrocarbon feed should be present in stoichiometric  
3 excess. It is typical that the molar ratio of aromatics to olefins be greater than  
4 four-to-one to prevent rapid catalyst fouling. The reaction temperature may  
5 range from 100°F to 600°F (38°C to 315°C), for example 250°F to 450°F  
6 (121°C to 232°C). The reaction pressure should be sufficient to maintain at  
7 least a partial liquid phase in order to retard catalyst fouling. This is typically  
8 50 psig to 1000 psig (0.345 to 6.89 Mpa gauge) depending on the feedstock  
9 and reaction temperature. Contact time may range from 10 seconds to 10  
10 hours, but is usually from 5 minutes to an hour. The weight hourly space  
11 velocity (WHSV), in terms of grams (pounds) of aromatic hydrocarbon and  
12 olefin per gram (pound) of catalyst per hour, is generally within the range of  
13 about 0.5 to 50.

14  
15           When transalkylation is the process conducted, the molar ratio of  
16 aromatic hydrocarbon will generally range from about 1:1 to 25:1, and for  
17 example from about 2:1 to 20:1. The reaction temperature may range from  
18 about 100°F to 600°F (38°C to 315°C), but it is typically about 250°F to 450°F  
19 (121°C to 232°C). The reaction pressure should be sufficient to maintain at  
20 least a partial liquid phase, typically in the range of about 50 psig to 1000 psig  
21 (0.345 to 6.89 Mpa gauge), for example 300 psig to 600 psig (2.07 to 4.14  
22 Mpa gauge). The weight hourly space velocity will range from about 0.1 to 10.  
23 U.S. Patent No. 5,082,990 issued on January 21, 1992 to Hsieh, et al.  
24 describes such processes.

25

#### 26                                   Conversion of Paraffins to Aromatics

27

28           SSZ-74 can be used to convert light gas C<sub>2</sub>-C<sub>6</sub> paraffins to higher  
29 molecular weight hydrocarbons including aromatic compounds. Typically, the  
30 molecular sieve will contain a catalyst metal or metal oxide wherein said metal  
31 is selected from the group consisting of Groups IB, IIB, VIII and IIIA of the  
32 Periodic Table, for example gallium, niobium, indium or zinc, in the range of  
33 from about 0.05 to 5% by weight.

## Isomerization of Olefins

SSZ-74 can be used to isomerize olefins. The feed stream is a hydrocarbon stream containing at least one C<sub>4-6</sub> olefin, for example a C<sub>4-6</sub> normal olefin such as normal butene. Normal butene as used in this specification means all forms of normal butene, e.g., 1-butene, cis-2-butene, and trans-2-butene. Typically, hydrocarbons other than normal butene or other C<sub>4-6</sub> normal olefins will be present in the feed stream. These other hydrocarbons may include, e.g., alkanes, other olefins, aromatics, hydrogen, and inert gases.

The feed stream typically may be the effluent from a fluid catalytic cracking unit or a methyl-tert-butyl ether unit. A fluid catalytic cracking unit effluent typically contains about 40-60 weight percent normal butenes. A methyl-tert-butyl ether unit effluent typically contains 40-100 weight percent normal butene. The feed stream typically contains at least about 40 weight percent normal butene, for example at least about 65 weight percent normal butene. The terms iso-olefin and methyl branched iso-olefin may be used interchangeably in this specification.

The process is carried out under isomerization conditions. The hydrocarbon feed is contacted in a vapor phase with a catalyst comprising the SSZ-74. The process may be carried out generally at a temperature from about 625°F to about 950°F (329-510°C), for butenes, for example from about 700°F to about 900°F (371-482°C) or from about 350°F to about 650°F (177-343°C) for pentenes and hexenes. The pressure ranges from subatmospheric to about 200 psig (1.38 Mpa gauge), for example from about 15 psig to about 200 psig (0.103 to 1.38 Mpa gauge) or from about 1 psig to about 150 psig (0.00689 to 1.03 Mpa gauge).

The liquid hourly space velocity during contacting is generally from about 0.1 to about 50 hr<sup>-1</sup>, based on the hydrocarbon feed, for example from

1 about 0.1 to about 20 hr<sup>-1</sup>, from about 0.2 to about 10 hr<sup>-1</sup>, or from about 1 to  
2 about 5 hr<sup>-1</sup>. A hydrogen/hydrocarbon molar ratio is maintained from about 0  
3 to about 30 or higher. The hydrogen can be added directly to the feed stream  
4 or directly to the isomerization zone. The reaction is typically substantially free  
5 of water, typically less than about two weight percent based on the feed. The  
6 process can be carried out in a packed bed reactor, a fixed bed, fluidized bed  
7 reactor, or a moving bed reactor. The bed of the catalyst can move upward or  
8 downward. The mole percent conversion of, e.g., normal butene to iso-butene  
9 is at least 10, for example at least 25 or at least 35.

### 11 Xylene Isomerization

12  
13 SSZ-74 may also be useful in a process for isomerizing one or more  
14 xylene isomers in a C<sub>8</sub> aromatic feed to obtain ortho-, meta-, and para-xylene  
15 in a ratio approaching the equilibrium value. In particular, xylene isomerization  
16 is used in conjunction with a separate process to manufacture para-xylene.  
17 For example, a portion of the para-xylene in a mixed C<sub>8</sub> aromatics stream may  
18 be recovered by crystallization and centrifugation. The mother liquor from the  
19 crystallizer is then reacted under xylene isomerization conditions to restore  
20 ortho-, meta- and para-xylenes to a near equilibrium ratio. At the same time,  
21 part of the ethylbenzene in the mother liquor is converted to xylenes or to  
22 products which are easily separated by filtration. The isomerate is blended  
23 with fresh feed and the combined stream is distilled to remove heavy and light  
24 by-products. The resultant C<sub>8</sub> aromatics stream is then sent to the crystallizer  
25 to repeat the cycle.

26  
27 Optionally, isomerization in the vapor phase is conducted in the  
28 presence of 3.0 to 30.0 moles of hydrogen per mole of alkylbenzene (e.g.,  
29 ethylbenzene). If hydrogen is used, the catalyst should comprise about 0.1 to  
30 2.0 wt.% of a hydrogenation/dehydrogenation component selected from  
31 Group VIII (of the Periodic Table) metal component, especially platinum or  
32 nickel. By Group VIII metal component is meant the metals and their  
33 compounds such as oxides and sulfides.

Optionally, the isomerization feed may contain 10 to 90 wt. of a diluent such as toluene, trimethylbenzene, naphthenes or paraffins.

## Oligomerization

It is expected that SSZ-74 can also be used to oligomerize straight and branched chain olefins having from about 2 to 21, for example 2-5 carbon atoms. The oligomers which are the products of the process are medium to heavy olefins which are useful for both fuels, i.e., gasoline or a gasoline blending stock and chemicals.

The oligomerization process comprises contacting the olefin feedstock in the gaseous or liquid phase with a catalyst comprising SSZ-74.

The molecular sieve can have the original cations associated therewith replaced by a wide variety of other cations according to techniques well known in the art. Typical cations would include hydrogen, ammonium and metal cations including mixtures of the same. Of the replacing metallic cations, cations of metals such as rare earth metals, manganese, calcium, as well as metals of Group II of the Periodic Table, e.g., zinc, and Group VIII of the Periodic Table, e.g., nickel are particularly desirable. One of the prime requisites is that the molecular sieve have a fairly low aromatization activity, i.e., in which the amount of aromatics produced is not more than about 20% by weight. This is accomplished by using a molecular sieve with controlled acid activity [alpha value] of from about 0.1 to about 120, for example from about 0.1 to about 100, as measured by its ability to crack n-hexane.

Alpha values are defined by a standard test known in the art, e.g., as shown in U.S. Patent No. 3,960,978 issued on June 1, 1976 to Givens et al. If required, such molecular sieves may be obtained by steaming, by use in a conversion process or by any other method which may occur to one skilled in this art.

### Condensation of Alcohols

SSZ-74 can be used to condense lower aliphatic alcohols having 1 to 10 carbon atoms to a gasoline boiling point hydrocarbon product comprising mixed aliphatic and aromatic hydrocarbon. The process disclosed in U.S. Patent No. 3,894,107, issued July 8, 1975 to Butter et al., describes the process conditions used in this process.

The catalyst may be in the hydrogen form or may be base exchanged or impregnated to contain ammonium or a metal cation complement, typically in the range of from about 0.05 to 5% by weight. The metal cations that may be present include any of the metals of the Groups I through VIII of the Periodic Table. However, in the case of Group IA metals, the cation content should in no case be so large as to effectively inactivate the catalyst, nor should the exchange be such as to eliminate all acidity. There may be other processes involving treatment of oxygenated substrates where a basic catalyst is desired.

### Methane Upgrading

Higher molecular weight hydrocarbons can be formed from lower molecular weight hydrocarbons by contacting the lower molecular weight hydrocarbon with a catalyst comprising SSZ-74 and a metal or metal compound capable of converting the lower molecular weight hydrocarbon to a higher molecular weight hydrocarbon. Examples of such reactions include the conversion of methane to C<sub>2+</sub> hydrocarbons such as ethylene or benzene or both. Examples of useful metals and metal compounds include lanthanide and or actinide metals or metal compounds.

These reactions, the metals or metal compounds employed and the conditions under which they can be run are disclosed in U.S. Patents No.

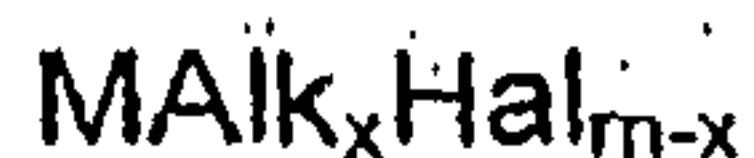
1 4,734,537, issued March 29, 1988 to Devries et al.; 4,939,311, issued July 3,  
2 1990 to Washecheck et al.; 4,962,261, issued October 9, 1990 to Abrevaya et  
3 al.; 5,095,161, issued March 10, 1992 to Abrevaya et al.; 5,105,044, issued  
4 April 14, 1992 to Han et al.; 5,105,046, issued April 14, 1992 to Washecheck;  
5 5,238,898, issued August 24, 1993 to Han et al.; 5,321,185, issued June 14,  
6 1994 to van der Vaart; and 5,336,825, issued August 9, 1994 to Choudhary et  
7 al.

#### 8 Polymerization of 1-Olefins

9  
10 The molecular sieve of the present invention may be used in a catalyst  
11 for the polymerization of 1-olefins, e.g., the polymerization of ethylene. To  
12 form the olefin polymerization catalyst, the molecular sieve as hereinbefore  
13 described is reacted with a particular type of organometallic compound.  
14 Organometallic compounds useful in forming the polymerization catalyst  
15 include trivalent and tetravalent organotitanium and organochromium  
16 compounds having alkyl moieties and, optionally, halo moieties. In the context  
17 of the present invention the term "alkyl" includes both straight and branched  
18 chain alkyl, cycloalkyl and alkaryl groups such as benzyl.

19  
20 Examples of trivalent and tetravalent organochromium and  
21 organotitanium compounds are disclosed in U.S. Patent No. 4,376,722,  
22 issued March 15, 1983 to Chester et al., U.S. Patent No. 4,377,497, issued  
23 March 22, 1983 to Chester et al., U.S. Patent No. 4,446,243, issued May 1,  
24 1984 to Chester et al., and U.S. Patent No. 4,526,942, issued July 2, 1985 to  
25 Chester et al.

26  
27 Examples of the organometallic compounds used to form the  
28 polymerization catalyst include, but are not limited to, compounds  
29 corresponding to the general formula:



wherein M is a metal selected from titanium and chromium; Alk is alkyl; Hal is halogen (e.g., Cl or Br); x is 1-4; and m is greater than or equal to x and is 3 or 4.

Examples of organotitanium and organochromium compounds encompassed by such a formula include compounds of the formula  $CrAlk_4$ ,  $CrAlk_3$ ,  $CrAlk_3Hal$ ,  $CrAlk_2Hal$ ,  $CrAlk_2Hal_2$ ,  $CrAlkHal_2$ ,  $CrAlkHal_3$ ,  $TiAlk_4$ ,  $TiAlk_3$ ,  $TiAlk_3Hal$ ,  $TiAlk_2Hal$ ,  $TiAlk_2Hal_2$ ,  $TiAlkHal_2$ ,  $TiAlkHal_3$ , wherein Hal can be Cl or Br and Alk can be methyl, ethyl, propyl, isopropyl, butyl, isobutyl, sec-butyl, tert-butyl, pentyl, isopentyl, neopentyl, hexyl, isohexyl, neohexyl, 2-ethylbutyl, octyl, 2-ethylhexyl, 2,2-diethylbutyl, 2-isopropyl-3-methylbutyl, etc., cyclohexylalkyls such as, for example, cyclohexylmethyl, 2-cyclohexylethyl, 3-cyclohexylpropyl, 4-cyclohexylbutyl, and the corresponding alkyl-substituted cyclohexyl radicals as, for example, (4-methylcyclohexyl)methyl, neophyl, i.e., beta, beta-dimethyl-phenethyl, benzyl, ethylbenzyl, and p-isopropylbenzyl. Desirable examples of Y include  $C_{1-5}$  alkyl, especially butyl.

The organotitanium and organochromium materials employed in the catalyst can be prepared by techniques well known in the art. See, for example the aforementioned Chester et al. patents.

The organotitanium or organochromium compounds can be with the molecular sieve of the present invention, such as by reacting the organometallic compound and the molecular sieve, in order to form the olefin polymerization catalyst. Generally, such a reaction takes place in the same reaction medium used to prepare the organometallic compound under conditions which promote formation of such a reaction product. The molecular sieve can simply be added to the reaction mixture after formation of the organometallic compound has been completed. Molecular sieve is added in an amount sufficient to provide from about 0.1 to 10 parts by weight, for

1 example from about 0.5 to 5 parts by weight, of organometallic compound in  
2 the reaction medium per 100 parts by weight of molecular sieve.

3  
4 Temperature of the reaction medium during reaction of organometallic  
5 compound with molecular sieve is also maintained at a level which is low  
6 enough to ensure the stability of the organometallic reactant. Thus,  
7 temperatures in the range of from about  $-150^{\circ}\text{C}$ . to  $50^{\circ}\text{C}$ ., for example from  
8 about  $-80^{\circ}\text{C}$ . to  $0^{\circ}\text{C}$ . can be usefully employed. Reaction times of from about  
9 0.01 to 10 hours, more for example from about 0.1 to 1 hour, can be  
10 employed in reacting the organotitanium or organochromium compound with  
11 the molecular sieve.

12  
13 Upon completion of the reaction, the catalyst material so formed may  
14 be recovered and dried by evaporating the reaction medium solvent under a  
15 nitrogen atmosphere. Alternatively, olefin polymerization reactions can be  
16 conducted in this same solvent based reaction medium used to form the  
17 catalyst.

18  
19 The polymerization catalyst can be used to catalyze polymerization of  
20 1-olefins. The polymers produced using the catalysts of this invention are  
21 normally solid polymers of at least one mono-1-olefin containing from 2 to 8  
22 carbon atoms per molecule. These polymers are normally solid  
23 homopolymers of ethylene or copolymers of ethylene with another mono-1-  
24 olefin containing 3 to 8 carbon atoms per molecule. Exemplary copolymers  
25 include those of ethylene/propylene, ethylene/1-butene, ethylene/1-hexene,  
26 and ethylene/1-octene and the like. The major portion of such copolymers is  
27 derived from ethylene and generally consists of about 80-99, for example 95-  
28 99 mole percent of ethylene. These polymers are well suited for extrusion,  
29 blow molding, injection molding and the like.

30  
31 The polymerization reaction can be conducted by contacting monomer  
32 or monomers, e.g., ethylene, alone or with one or more other olefins, and in  
33 the substantial absence of catalyst poisons such as moisture and air, with a

1 catalytic amount of the supported organometallic catalyst at a temperature  
2 and at a pressure sufficient to initiate the polymerization reaction. If desired,  
3 an inert organic solvent may be used as a diluent and to facilitate materials  
4 handling if the polymerization reaction is conducted with the reactants in the  
5 liquid phase, e.g. in a particle form (slurry) or solution process. The reaction  
6 may also be conducted with reactants in the vapor phase, e.g., in a fluidized  
7 bed arrangement in the absence of a solvent but, if desired, in the presence of  
8 an inert gas such as nitrogen.

9  
10 The polymerization reaction is carried out at temperatures of from  
11 about 30° C. or less, up to about 200° C. or more, depending to a great extent  
12 on the operating pressure, the pressure of the olefin monomers, and the  
13 particular catalyst being used and its concentration. Naturally, the selected  
14 operating temperature is also dependent upon the desired polymer melt index  
15 since temperature is definitely a factor in adjusting the molecular weight of the  
16 polymer. Typically, the temperature used is from about 30° C. to about 100°  
17 C. in a conventional slurry or "particle forming" process or from 100° C. to  
18 150° C. in a "solution forming" process. A temperature of from about 70° C to  
19 110° C. can be employed for fluidized bed processes.

20  
21 The pressure to be used in the polymerization reactions can be any  
22 pressure sufficient to initiate the polymerization of the monomer(s) to high  
23 molecular weight polymer. The pressure, therefore, can range from  
24 subatmospheric pressures, using an inert gas as diluent, to superatmospheric  
25 pressures of up to about 30,000 psig or more, for example from atmospheric  
26 (0 psig) up to about 1000 psig. As a general rule, a pressure of 20 to 800 psig  
27 is desirable.

28  
29 The selection of an inert organic solvent medium to be employed in the  
30 solution or slurry process embodiments of this invention is not too critical, but  
31 the solvent should be inert to the supported organometallic catalyst and olefin  
32 polymer produced, and be stable at the reaction temperature used. It is not  
33 necessary, however, that the inert organic solvent medium also serve as a

1 solvent for the polymer to be produced. Among the inert organic solvents  
2 applicable for such purposes may be mentioned saturated aliphatic  
3 hydrocarbons having from about 3 to 12 carbon atoms per molecule such as  
4 hexane, heptane, pentane, isooctane, purified kerosene and the like,  
5 saturated cycloaliphatic hydrocarbons having from about 5 to 12 carbon  
6 atoms per molecule such as cyclohexane, cyclopentane,  
7 dimethylcyclopentane and methylcyclohexane and the like and aromatic  
8 hydrocarbons having from about 6 to 12 carbon atoms per molecule such as  
9 benzene, toluene, xylene, and the like. Particularly desirable solvent media  
10 are cyclohexane, pentane, hexane and heptane.

11

12 Hydrogen can be introduced into the polymerization reaction zone in  
13 order to decrease the molecular weight of the polymers produced (i.e., give a  
14 much higher Melt Index, MI). Partial pressure of hydrogen when hydrogen is  
15 used can be within the range of 5 to 100 psig, for example 25 to 75 psig. The  
16 melt indices of the polymers produced in accordance with the instant invention  
17 can range from about 0.1 to about 70 or even higher.

18

19 More detailed description of suitable polymerization conditions  
20 including examples of particle form, solution and fluidized bed polymerization  
21 arrangements are found in Karapinka; U.S. Pat. No. 3,709,853; Issued Jan. 9,  
22 1973 and Karol et al; U.S. Pat. No. 4,086,408; Issued Apr. 25, 1978.

23

#### 24 Hydrotreating

25

26 SSZ-74 is useful in a hydrotreating catalyst. During hydrotreatment,  
27 oxygen, sulfur and nitrogen present in the hydrocarbonaceous feed is reduced  
28 to low levels. Aromatics and olefins, if present in the feed, may also have their  
29 double bonds saturated. In some cases, the hydrotreating catalyst and  
30 hydrotreating conditions are selected to minimize cracking reactions, which  
31 can reduce the yield of the most desulfided product (typically useful as a fuel).

1           Hydrotreating conditions typically include a reaction temperature  
2   between 400-900°F (204-482°C), for example 650-850°F (343-454°C); a  
3   pressure between 500 and 5000 psig (3.5-34.6 Mpa), for example 1000 to  
4   3000 psig (7.0-20.8 MPa); a feed rate (LHSV) of 0.5 hr<sup>-1</sup> to 20 hr<sup>-1</sup> (v/v); and  
5   overall hydrogen consumption 300 to 2000 scf per barrel of liquid hydrocarbon  
6   feed (53.4-356 m<sup>3</sup> H<sub>2</sub>/m<sup>3</sup> feed). The hydrotreating catalyst will typically be a  
7   composite of a Group VI metal or compound thereof, and a Group VIII metal  
8   or compound thereof supported on the molecular sieve of this invention..  
9   Typically, such hydrotreating catalyst are presulfided.

10  
11           Catalysts useful for hydrotreating hydrocarbon feeds are disclosed in  
12   U.S. Patents No. 4,347,121, issued August 31, 1982 to Mayer et al, and  
13   4,810,357, issued March 7, 1989 to Chester et al. Suitable catalysts include  
14   noble metals from Group VIII, such as Fe, Co, Ni, Pt or Pd, and/or Group VI  
15   metals, such as Cr, Mo, Sn or W. Examples of combinations of Group VIII and  
16   Group VI metals include Ni-Mo or Ni-Sn. Other suitable catalysts are  
17   described in U. S. Patents No. 4,157,294, issued June 5, 1979 to Iwao et al,  
18   and 3,904,513, issued September 9, 1975 to Fischer et al. U. S. Patent No.  
19   3,852,207, issued December 3, 1974 to Strangeland et al, describes suitable  
20   noble metal catalysts and mild hydrotreating conditions.

21  
22           The amount of hydrogenation component(s) in the catalyst suitably  
23   range from about 0.5% to about 10% by weight of Group VIII component(s)  
24   and from 5% to about 25% by weight of Group VI metal component(s),  
25   calculated as metal oxide(s) per 100 parts by weight of total catalyst., where  
26   the percentages by weight are based on the weight of the catalyst before  
27   sulfiding. The hydrogenation component(s) in the catalyst may be in the oxidic  
28   and/or sulfidic form.

### Hydrogenation

SSZ-74 can be used in a catalyst to catalyze hydrogenation of a hydrocarbon feed containing unsaturated hydrocarbons. The unsaturated hydrocarbons can comprise olefins, dienes, polyenes, aromatic compounds and the like.

Hydrogenation is accomplished by contacting the hydrocarbon feed containing unsaturated hydrocarbons with hydrogen in the presence of a catalyst comprising SSZ-74. The catalyst can also contain one or more metals of Group VIB and Group VIII, including salts, complexes and solutions thereof. Reference to these catalytically active metals is intended to encompass such metals or metals in the elemental state or in some form such as an oxide, sulfide, halide, carboxylate and the like. Examples of such metals include metals, salts or complexes wherein the metal is selected from the group consisting of platinum, palladium, rhodium, iridium or combinations thereof, or the group consisting of nickel, molybdenum, cobalt, tungsten, titanium, chromium, vanadium, rhenium, manganese and combinations thereof.

The hydrogenation component of the catalyst (i.e., the aforementioned metal) is present in an amount effective to provide the hydrogenation function of the catalyst, for example in the range of from 0.05 to 25% by weight.

Hydrogenation conditions, such as temperature, pressure, space velocities, contact time and the like are well known in the art.

### Reduction of Oxides of Nitrogen

SSZ-74 may be used for the catalytic reduction of the oxides of nitrogen in a gas stream. Typically, the gas stream also contains oxygen, often a stoichiometric excess thereof. Also, the molecular sieve may contain a metal or metal ions within or on it which are capable of catalyzing the reduction of the nitrogen oxides. Examples of such metals or metal ions

1 include cobalt, copper, platinum, iron, chromium, manganese, nickel, zinc,  
2 lanthanum, palladium, rhodium and mixtures thereof.

3  
4 One example of such a process for the catalytic reduction of oxides of  
5 nitrogen in the presence of a zeolite is disclosed in U.S. Patent No. 4,297,328,  
6 issued October 27, 1981 to Ritscher et al. There, the catalytic process is the  
7 combustion of carbon monoxide and hydrocarbons and the catalytic reduction  
8 of the oxides of nitrogen contained in a gas stream, such as the exhaust gas  
9 from an internal combustion engine. The zeolite used is metal ion-exchanged,  
10 doped or loaded sufficiently so as to provide an effective amount of catalytic  
11 copper metal or copper ions within or on the zeolite. In addition, the process is  
12 conducted in an excess of oxidant, e.g., oxygen.

#### 13 14 Partial Oxidation

15  
16 The partial oxidation of low value hydrocarbons such as alkanes and  
17 alkenes into high value products such as alcohols and epoxides is of great  
18 commercial interest. These oxidation products are not only valuable as is, but  
19 also as intermediates for specialty chemicals including pharmaceuticals and  
20 pesticides.

21  
22 U.S. Patent No. 4,410,501, issued October 18, 1983 to Esposito et al.,  
23 discloses a titanium-containing analogue of the all-silica ZSM-5 molecular  
24 sieve. This material (known as "TS-1") has been found to be useful in  
25 catalyzing a wide range of partial oxidation chemistries, for example the  
26 production of catechol and hydroquinone from phenol and hydrogen peroxide  
27 ( $\text{H}_2\text{O}_2$ ) and the manufacture of propylene oxide and cyclohexanone oxime  
28 from propylene and cyclohexanone, respectively. In addition, TS-1 can be  
29 used to catalyze the reaction of alkanes and aqueous  $\text{H}_2\text{O}_2$  to form alcohols  
30 and ketones. (See Huybrechts, D.R.C. et al., *Nature* 1990, 345, 240-242 and  
31 Tatsumi, T. et al., *J.C.S. Chem. Commun.* 1990, 476-477.)

1 TS-1 has many salient features, other than its catalytic abilities, which  
2 make it attractive as a commercial catalyst. Most importantly, it is a solid. This  
3 allows for easy separation from the reactants and products (typically liquids)  
4 by simple, inexpensive filtration. Moreover, this solid has high thermal stability  
5 and a very long lifetime. Calcination in air at moderate temperatures (550°C)  
6 restores the material to its original catalytic ability. TS-1 performs best at mild  
7 temperatures (<100°C) and pressures (1 atm). The oxidant used for reactions  
8 catalyzed by TS-1 is aqueous H<sub>2</sub>O<sub>2</sub>, which is important because aqueous  
9 H<sub>2</sub>O<sub>2</sub> is relatively inexpensive and its by-product is water. Hence, the choice  
10 of oxidant is favorable from both a commercial and environmental point of  
11 view.

12  
13 While a catalyst system based on TS-1 has many useful features, it  
14 has one serious drawback. The zeolite structure of TS-1 includes a regular  
15 system of pores which are formed by nearly circular rings of ten silicon atoms  
16 (called 10-membered rings, or simply "10 rings") creating pore diameters of  
17 approximately 5.5 Å. This small size results in the exclusion of molecules  
18 larger than 5.5 Å. Because the catalytically active sites are located within the  
19 pores of the zeolite, any exclusion of molecules from the pores results in poor  
20 catalytic activity.

21  
22 SSZ-74 containing titanium oxide (Ti-SSZ-74) is useful as a catalyst in  
23 oxidation reactions, particularly in the oxidation of hydrocarbons. Examples of  
24 such reactions include, but are not limited to, the epoxidation of olefins, the  
25 oxidation of alkanes, and the oxidation of sulfur-containing, nitrogen-  
26 containing or phosphorus-containing compounds.

27  
28 The amount of Ti-SSZ-74 catalyst employed is not critical, but should  
29 be sufficient so as to substantially accomplish the desired oxidation reaction in  
30 a practicably short period of time (i.e., a catalytically effective amount). The  
31 optimum quantity of catalyst will depend upon a number of factors including  
32 reaction temperature, the reactivity and concentration of the substrate,  
33 hydrogen peroxide concentration, type and concentration of organic solvent,

1 as well as the activity of the catalyst. Typically, however, the amount of  
2 catalyst will be from about 0.001 to 10 grams per mole of substrate.

3  
4 Typically, the Ti-SSZ-74 is thermally treated (calcined) prior to use as a  
5 catalyst.

6  
7 The oxidizing agent employed in the oxidation processes of this  
8 invention is a hydrogen peroxide source such as hydrogen peroxide ( $H_2O_2$ ) or  
9 a hydrogen peroxide precursor (i.e., a compound which under the oxidation  
10 reaction conditions is capable of generating or liberating hydrogen peroxide).

11  
12 The amount of hydrogen peroxide relative to the amount of substrate is  
13 not critical, but must be sufficient to cause oxidation of at least some of the  
14 substrate. Typically, the molar ratio of hydrogen peroxide to substrate is from  
15 about 100:1 to about 1:100, for example 10:1 to about 1:10. When the  
16 substrate is an olefin containing more than one carbon-carbon double bond,  
17 additional hydrogen peroxide may be required. Theoretically, one equivalent  
18 of hydrogen peroxide is required to oxidize one equivalent of a mono-  
19 unsaturated substrate, but it may be desirable to employ an excess of one  
20 reactant to optimize selectivity to the epoxide. In particular, the use of a  
21 moderate to large excess (e.g., 50 to 200%) of olefin relative to hydrogen  
22 peroxide may be advantageous for certain substrates.

23  
24 If desired, a solvent may additionally be present during the oxidation  
25 reaction in order to dissolve the reactants other than the Ti-SSZ-74, to provide  
26 better temperature control, or to favorably influence the oxidation rates and  
27 selectivities. The solvent, if present, may comprise from 1 to 99 weight  
28 percent of the total oxidation reaction mixture and is desirably selected such  
29 that it is a liquid at the oxidation reaction temperature. Organic compounds  
30 having boiling points at atmospheric pressure of from about  $50^\circ C$  to about  
31  $150^\circ C$  are generally desirable for use. Excess hydrocarbon may serve as a  
32 solvent or diluent. Illustrative examples of other suitable solvents include, but  
33 are not limited to, ketones (e.g., acetone, methyl ethyl ketone, acetophenone),

1 ethers (e.g., tetrahydrofuran, butyl ether), nitriles (e.g., acetonitrile), aliphatic  
2 and aromatic hydrocarbons, halogenated hydrocarbons, and alcohols (e.g.,  
3 methanol, ethanol, isopropyl alcohol, t-butyl alcohol, alpha-methyl benzyl  
4 alcohol, cyclohexanol). More than one type of solvent may be utilized. Water  
5 may also be employed as a solvent or diluent.

6  
7 The reaction temperature is not critical, but should be sufficient to  
8 accomplish substantial conversion of the substrate within a reasonably short  
9 period of time. It is generally advantageous to carry out the reaction to  
10 achieve as high a hydrogen peroxide conversion as possible, typically at least  
11 about 50%, for example at least about 90% or at least about 95%, consistent  
12 with reasonable selectivities. The optimum reaction temperature will be  
13 influenced by catalyst activity, substrate reactivity, reactant concentrations,  
14 and type of solvent employed, among other factors, but typically will be in a  
15 range of from about 0°C to about 150°C (for example from about 25°C to  
16 about 120°C). Reaction or residence times from about one minute to about 48  
17 hours (for example from about ten minutes to about eight hours) will typically  
18 be appropriate, depending upon the above-identified variables. Although  
19 subatmospheric pressures can be employed, the reaction is typically  
20 performed at atmospheric or at elevated pressure (typically, between one and  
21 100 atmospheres), especially when the boiling point of the substrate is below  
22 the oxidation reaction temperature. Generally, it is desirable to pressurize the  
23 reaction vessel sufficiently to maintain the reaction components as a liquid  
24 phase mixture. Most (over 50%) of the substrate should desirably be present  
25 in the liquid phase.

26  
27 The oxidation process of this invention may be carried out in a batch,  
28 continuous, or semi-continuous manner using any appropriate type of reaction  
29 vessel or apparatus such as a fixed bed, transport bed, fluidized bed, stirred  
30 slurry, or CSTR reactor. The reactants may be combined all at once or  
31 sequentially. For example, the hydrogen peroxide or hydrogen peroxide  
32 precursor may be added incrementally to the reaction zone. The hydrogen

1 peroxide could also be generated in situ within the same reactor zone where  
2 oxidation is taking place.

3  
4 Once the oxidation has been carried out to the desired degree of  
5 conversion, the oxidized product may be separated and recovered from the  
6 reaction mixture using any appropriate technique such as fractional  
7 distillation, extractive distillation, liquid-liquid extraction, crystallization, or the  
8 like.

### 10 Olefin Epoxidation

11  
12 One of the oxidation reactions for which Ti-SSZ-74 is useful as a  
13 catalyst is the epoxidation of olefins. The olefin substrate epoxidized in the  
14 process of this invention may be any organic compound having at least one  
15 ethylenically unsaturated functional group (i.e., a carbon-carbon double bond)  
16 and may be a cyclic, branched or straight-chain olefin. The olefin may contain  
17 aryl groups (e.g., phenyl, naphthyl). Typically, the olefin is aliphatic in  
18 character and contains from 2 to about 20 carbon atoms. The use of light  
19 (low-boiling) C<sub>2</sub> to C<sub>10</sub> mono-olefins is especially advantageous.

20  
21 More than one carbon-carbon double bond may be present in the  
22 olefin, i.e., dienes, trienes and other polyunsaturated substrates may be used.  
23 The double bond may be in a terminal or internal position in the olefin or may  
24 alternatively form part of a cyclic structure (as in cyclooctene, for example).

25  
26 Other examples of suitable substrates include unsaturated fatty acids  
27 or fatty acid derivatives such as esters.

28  
29 The olefin may contain substituents other than hydrocarbon  
30 substituents such as halide, carboxylic acid, ether, hydroxy, thiol, nitro, cyano,  
31 ketone, acyl, ester, anhydride, amino, and the like.

32

Exemplary olefins suitable for use in the process of this invention include ethylene, propylene, the butenes (i.e., 1,2-butene, 2,3-butene, isobutylene), butadiene, the pentenes, isoprene, 1-hexene, 3-hexene, 1-heptene, 1-octene, diisobutylene, 1-nonene, 1-tetradecene, pentamycene, camphene, 1-undecene, 1-dodecene, 1-tridecene, 1-tetradecene, 1-pentadecene, 1-hexadecene, 1-heptadecene, 1-octadecene, 1-nonadecene, 1-eicosene, the trimers and tetramers of propylene, cyclopentene, cyclohexene, cycloheptene, cyclooctene, cyclooctadiene, dicyclopentadiene, methylenecyclopropane, methylenecyclopentane, methylenecyclohexane, vinyl cyclohexane, vinyl cyclohexene, methallyl ketone, allyl chloride, the dichlorobutenes, allyl alcohol, allyl carbonate, allyl acetate, alkyl acrylates and methacrylates, diallyl maleate, diallyl phthalate, and unsaturated fatty acids, such as oleic acid, linolenic acid, linoleic acid, erucic acid, palmitoleic acid, and ricinoleic acid and their esters (including mono-, di-, and triglyceride esters) and the like.

Olefins which are especially useful for epoxidation are the C<sub>2</sub>-C<sub>20</sub> olefins having the general structure



wherein R<sup>3</sup>, R<sup>4</sup>, R<sup>5</sup> and R<sup>6</sup> are the same or different and are selected from the group consisting of hydrogen and C<sub>1</sub>-C<sub>18</sub> alkyl.

Mixtures of olefins may be epoxidized and the resulting mixtures of epoxides either employed in the mixed form or separated into the different component epoxides.

The present invention further provides a process for oxidation of hydrocarbons comprising contacting said hydrocarbon with hydrogen peroxide in the presence of a catalytically effective amount of Ti-SSZ-74 for a time and at a temperature effective to oxidize said hydrocarbon.

## Acylation

The molecular sieve of the present invention can be used in a catalyst for acylating an aromatic substrate  $\text{ArH}_n$ , where  $n$  is at least 1, by reacting the aromatic substrate with an acylating agent in the presence of the catalyst. The product of the acylation reaction is  $\text{ArH}_{n-1}\text{COR}$  where  $R$  is an organic radical.

Examples of the aromatic substrate include, but are not limited to, benzene, toluene, anisole and 2-naphthol. Examples of the acylating agent included, but are not limited to, carboxylic acid derivatives, carboxylic acids, acid anhydrides, esters, and acyl halides.

Reaction conditions are known in the art (see, for example, U. S. Patent No. 6,630,606, issued October 7, 2003 to Poliakoff et al., U. S. Patent No. 6,459,000, issued October 1, 2002 to Choudhary et al., and U. S. Patent No. 6,548,722, issued April 15, 2003 to Choudhary et al.). Typically, the acylation reaction is conducted with a weight ratio of the catalyst to the acylating agent of about 0.03 to about 0.5, a mole ratio of aromatic substrate to acylating agent of about 1.0 to about 20, a reaction temperature in the range of about 20°C to about 200°C, a reaction pressure in the range of about 1 atm to about 5 atm, and a reaction time of about 0.05 hours to about 20 hours.

## Oxygenate Conversion

The present invention comprises a process for catalytic conversion of a feedstock comprising one or more oxygenates comprising alcohols and ethers to a hydrocarbon product containing light olefins, i.e.,  $\text{C}_2$ ,  $\text{C}_3$  and/or  $\text{C}_4$  olefins. The feedstock is contacted with the molecular sieve of the present invention at effective process conditions to produce light olefins.

1           The term "oxygenate" as used herein designates compounds such as  
2 alcohols, ethers and mixtures thereof. Examples of oxygenates include, but  
3 are not limited to, methanol and dimethyl ether.

4  
5           The process of the present invention may be conducted in the  
6 presence of one or more diluents which may be present in the oxygenate feed  
7 in an amount between about 1 and about 99 molar percent, based on the total  
8 number of moles of all feed and diluent components. Diluents include, but are  
9 not limited to, helium, argon, nitrogen, carbon monoxide, carbon dioxide,  
10 hydrogen, water, paraffins, hydrocarbons (such as methane and the like),  
11 aromatic compounds, or mixtures thereof. U. S. Patents No. 4,861,938 and  
12 4,677,242, emphasize the use of a diluent to maintain catalyst selectivity  
13 toward the production of light olefins, particularly ethylene.

14  
15           The oxygenate conversion is desirably conducted in the vapor phase  
16 such that the oxygenate feedstock is contacted in a vapor phase in a reaction  
17 zone with the molecular sieve of this invention at effective process conditions  
18 to produce hydrocarbons, i.e., an effective temperature, pressure, weight  
19 hourly space velocity (WHSV) and, optionally, an effective amount of diluent.  
20 The process is conducted for a period of time sufficient to produce the desired  
21 light olefins. In general, the residence time employed to produce the desired  
22 product can vary from seconds to a number of hours. It will be readily  
23 appreciated that the residence time will be determined to a significant extent  
24 by the reaction temperature, the molecular sieve catalyst, the WHSV, the  
25 phase (liquid or vapor) and process design characteristics. The oxygenate  
26 feedstock flow rate affects olefin production. Increasing the feedstock flow  
27 rate increases WHSV and enhances the formation of olefin production relative  
28 to paraffin production. However, the enhanced olefin production relative to  
29 paraffin production is offset by a diminished conversion of oxygenate to  
30 hydrocarbons.

1       The oxygenate conversion process is effectively carried out over a  
2 wide range of pressures, including autogenous pressures. At pressures  
3 between about 0.01 atmospheres (0.1 kPa) and about 1000 atmospheres  
4 (101.3 kPa), the formation of light olefins will be affected although the  
5 optimum amount of product will not necessarily be formed at all pressures. A  
6 typical pressure is between about 0.01 atmospheres (0.1 kPa) and about 100  
7 atmospheres (10.13 kPa), for example from about 1 to about 10 atmospheres  
8 (101.3 kPa to 1.013 Mpa). The pressures referred to herein are exclusive of  
9 the diluent, if any, that is present and refer to the partial pressure of the  
10 feedstock as it relates to oxygenate compounds.

11

12       The temperature which may be employed in the oxygenate conversion  
13 process may vary over a wide range depending, at least in part, on the  
14 molecular sieve catalyst. In general, the process can be conducted at an  
15 effective temperature between about 200°C and about 700°C. At the lower  
16 end of the temperature range, and thus generally at a lower rate of reaction,  
17 the formation of the desired light olefins may become low. At the upper end of  
18 the range, the process may not form an optimum amount of light olefins and  
19 catalyst deactivation may be rapid.

20

21       The molecular sieve catalyst can be incorporated into solid particles in  
22 which the catalyst is present in an amount effective to promote the desired  
23 conversion of oxygenates to light olefins. In one aspect, the solid particles  
24 comprise a catalytically effective amount of the catalyst and at least one  
25 matrix material selected from the group consisting of binder materials, filler  
26 materials and mixtures thereof to provide a desired property or properties,  
27 e.g., desired catalyst dilution, mechanical strength and the like to the solid  
28 particles. Such matrix materials are often, to some extent, porous in nature  
29 and may or may not be effective to promote the desired reaction. Filler and  
30 binder materials include, for example, synthetic and naturally occurring  
31 substances such as metal oxides, clays, silicas, aluminas, silica-aluminas,  
32 silica-magnesias, silica-zirconias, silica-thorias and the like. If matrix materials  
33 are included in the catalyst composition, the molecular sieve desirably

1 comprises about 1 to 99%, for example about 5 to 90% or about 10 to 80%  
2 by weight of the total composition.

### 3 4 Gas Separation

5  
6 The molecular sieve of the present invention can be used to separate  
7 gasses. For example, it can be used to separate carbon dioxide from natural  
8 gas. Typically, the molecular sieve is used as a component in a membrane  
9 that is used to separate the gasses. Examples of such membranes are  
10 disclosed in U. S. Patent No. 6,508,860, issued January 21, 2003 to Kulkarni  
11 et al.

### 12 Synthesis of Amines

13  
14 The molecular sieve of the present invention can be used in a catalyst  
15 to prepare methylamine or dimethylamine. Dimethylamine is generally  
16 prepared in industrial quantities by continuous reaction of methanol (and/or  
17 dimethylether) and ammonia in the presence of a silica-alumina catalyst. The  
18 reactants are typically combined in the vapor phase, at temperatures in the  
19 range of 300°C to 500°C, and at elevated pressures. Such a process is  
20 disclosed in U. S. Patent No. 4,737,592, issued April 12, 1988 to Abrams et  
21 al.

22  
23 The catalyst is used in its acid form. Acid forms of molecular sieves can  
24 be prepared by a variety of techniques. Desirably, the molecular sieve used to  
25 prepare dimethylamine will be in the hydrogen form, or have an alkali or  
26 alkaline earth metal, such as Na, K, Rb, or Cs, ion-exchanged into it.

27  
28 The process of the present invention involves reacting methanol,  
29 dimethylether or a mixture thereof and ammonia in amounts sufficient to  
30 provide a carbon/nitrogen (C/N) ratio from about 0.2 to about 1.5, for example  
31 about 0.5 to about 1.2. The reaction is conducted at a temperature from about  
32 250°C to about 450°C, for example about 300°C to about 400°C. Reaction

1 pressures can vary from about 7-7000 kPa (1-1000 psi), for example about  
2 70-3000 kPa (10-500 psi). A methanol and/or dimethylether space time of  
3 about 0.01-80 hours, for example 0.10-1.5 hours, is typically used. This space  
4 time is calculated as the mass of catalyst divided by the mass flow rate of  
5 methanol/dimethylether introduced into the reactor.

#### 6 7 Treatment of Engine Exhaust (Cold Start Emissions)

8  
9 Gaseous waste products resulting from the combustion of  
10 hydrocarbonaceous fuels, such as gasoline and fuel oils, comprise carbon  
11 monoxide, hydrocarbons and nitrogen oxides as products of combustion or  
12 incomplete combustion, and pose a serious health problem with respect to  
13 pollution of the atmosphere. While exhaust gases from other carbonaceous  
14 fuel-burning sources, such as stationary engines, industrial furnaces, etc.,  
15 contribute substantially to air pollution, the exhaust gases from automotive  
16 engines are a principal source of pollution. Because of these health problem  
17 concerns, the Environmental Protection Agency (EPA) has promulgated strict  
18 controls on the amounts of carbon monoxide, hydrocarbons and nitrogen  
19 oxides which automobiles can emit. The implementation of these controls has  
20 resulted in the use of catalytic converters to reduce the amount of pollutants  
21 emitted from automobiles.

22  
23 In order to achieve the simultaneous conversion of carbon monoxide,  
24 hydrocarbon and nitrogen oxide pollutants, it has become the practice to  
25 employ catalysts in conjunction with air-to-fuel ratio control means which  
26 functions in response to a feedback signal from an oxygen sensor in the  
27 engine exhaust system. Although these three component control catalysts  
28 work quite well after they have reached operating temperature of about 300°  
29 C., at lower temperatures they are not able to convert substantial amounts of  
30 the pollutants. What this means is that when an engine and in particular an  
31 automobile engine is started up, the three component control catalyst is not  
32 able to convert the hydrocarbons and other pollutants to innocuous  
33 compounds.

1  
2        Adsorbent beds have been used to adsorb the hydrocarbons during the  
3 cold start portion of the engine. Although the process typically will be used  
4 with hydrocarbon fuels, the instant invention can also be used to treat exhaust  
5 streams from alcohol fueled engines. The adsorbent bed is typically placed  
6 immediately before the catalyst. Thus, the exhaust stream is first flowed  
7 through the adsorbent bed and then through the catalyst. The adsorbent bed  
8 preferentially adsorbs hydrocarbons over water under the conditions present  
9 in the exhaust stream. After a certain amount of time, the adsorbent bed has  
10 reached a temperature (typically about 150° C.) at which the bed is no longer  
11 able to remove hydrocarbons from the exhaust stream. That is, hydrocarbons  
12 are actually desorbed from the adsorbent bed instead of being adsorbed. This  
13 regenerates the adsorbent bed so that it can adsorb hydrocarbons during a  
14 subsequent cold start.

15  
16        The prior art reveals several references dealing with the use of  
17 adsorbent beds to minimize hydrocarbon emissions during a cold start engine  
18 operation. One such reference is U.S. Pat. No. 3,699,683 in which an  
19 adsorbent bed is placed after both a reducing catalyst and an oxidizing  
20 catalyst. The patentees disclose that when the exhaust gas stream is below  
21 200° C. the gas stream is flowed through the reducing catalyst then through  
22 the oxidizing catalyst and finally through the adsorbent bed, thereby adsorbing  
23 hydrocarbons on the adsorbent bed. When the temperature goes above 200°  
24 C. the gas stream which is discharged from the oxidation catalyst is divided  
25 into a major and minor portion, the major portion being discharged directly into  
26 the atmosphere and the minor portion passing through the adsorbent bed  
27 whereby unburned hydrocarbon is desorbed and then flowing the resulting  
28 minor portion of this exhaust stream containing the desorbed unburned  
29 hydrocarbons into the engine where they are burned.

30  
31        Another reference is U.S. Pat. No. 2,942,932 which teaches a process  
32 for oxidizing carbon monoxide and hydrocarbons which are contained in  
33 exhaust gas streams. The process disclosed in this patent consists of flowing

1 an exhaust stream which is below 800° F. into an adsorption zone which  
2 adsorbs the carbon monoxide and hydrocarbons and then passing the  
3 resultant stream from this adsorption zone into an oxidation zone. When the  
4 temperature of the exhaust gas stream reaches about 800° F. the exhaust  
5 stream is no longer passed through the adsorption zone but is passed directly  
6 to the oxidation zone with the addition of excess air.

7  
8 U. S. Patent No. 5,078,979, issued January 7, 1992 to Dunne,  
9 discloses treating an exhaust gas stream from an engine to prevent cold start  
10 emissions using a molecular sieve adsorbent bed. Examples of the molecular  
11 sieve include faujasites, clinoptilolites, mordenites, chabazite, silicalite, zeolite  
12 Y, ultrastable zeolite Y, and ZSM-5.

13  
14 Canadian Patent No. 1,205,980 discloses a method of reducing  
15 exhaust emissions from an alcohol fueled automotive vehicle. This method  
16 consists of directing the cool engine startup exhaust gas through a bed of  
17 zeolite particles and then over an oxidation catalyst and then the gas is  
18 discharged to the atmosphere. As the exhaust gas stream warms up it is  
19 continuously passed over the adsorption bed and then over the oxidation bed.

20  
21 As stated, this invention generally relates to a process for treating an  
22 engine exhaust stream and in particular to a process for minimizing emissions  
23 during the cold start operation of an engine. The engine consists of any  
24 internal or external combustion engine which generates an exhaust gas  
25 stream containing noxious components or pollutants including unburned or  
26 thermally degraded hydrocarbons or similar organics. Other noxious  
27 components usually present in the exhaust gas include nitrogen oxides and  
28 carbon monoxide. The engine may be fueled by a hydrocarbonaceous fuel.  
29 As used in this specification and in the appended claims, the term  
30 "hydrocarbonaceous fuel" includes hydrocarbons, alcohols and mixtures  
31 thereof. Examples of hydrocarbons which can be used to fuel the engine are  
32 the mixtures of hydrocarbons which make up gasoline or diesel fuel. The

1 alcohols which may be used to fuel engines include ethanol and methanol.  
2 Mixtures of alcohols and mixtures of alcohols and hydrocarbons can also be  
3 used. The engine may be a jet engine, gas turbine, internal combustion  
4 engine, such as an automobile, truck or bus engine, a diesel engine or the  
5 like. The process of this invention is particularly suited for hydrocarbon,  
6 alcohol, or hydrocarbon-alcohol mixture, internal combustion engine mounted  
7 in an automobile. For convenience the description will use hydrocarbon as the  
8 fuel to exemplify the invention. The use of hydrocarbon in the subsequent  
9 description is not to be construed as limiting the invention to hydrocarbon  
10 fueled engines.

11  
12 When the engine is started up, it produces a relatively high  
13 concentration of hydrocarbons in the engine exhaust gas stream as well as  
14 other pollutants. Pollutants will be used herein to collectively refer to any  
15 unburned fuel components and combustion byproducts found in the exhaust  
16 stream. For example, when the fuel is a hydrocarbon fuel, hydrocarbons,  
17 nitrogen oxides, carbon monoxide and other combustion byproducts will be  
18 found in the engine exhaust gas stream. The temperature of this engine  
19 exhaust stream is relatively cool, generally below 500° C. and typically in the  
20 range of 200° to 400° C. This engine exhaust stream has the above  
21 characteristics during the initial period of engine operation, typically for the  
22 first 30 to 120 seconds after startup of a cold engine. The engine exhaust  
23 stream will typically contain, by volume, about 500 to 1000 ppm  
24 hydrocarbons.

25  
26 The engine exhaust gas stream which is to be treated is flowed over a  
27 molecular sieve bed comprising molecular sieve SSZ-74 a first exhaust  
28 stream. Molecular sieve SSZ-74 is described herein. The first exhaust stream  
29 which is discharged from the molecular sieve bed is now flowed over a  
30 catalyst to convert the pollutants contained in the first exhaust stream to  
31 innocuous components and provide a treated exhaust stream which is  
32 discharged into the atmosphere. It is understood that prior to discharge into

1 the atmosphere, the treated exhaust stream may be flowed through a muffler  
2 or other sound reduction apparatus well known in the art.

3  
4 The catalyst which is used to convert the pollutants to innocuous  
5 components is usually referred to in the art as a three-component control  
6 catalyst because it can simultaneously oxidize any residual hydrocarbons  
7 present in the first exhaust stream to carbon dioxide and water, oxidize any  
8 residual carbon monoxide to carbon dioxide and reduce any residual nitric  
9 oxide to nitrogen and oxygen. In some cases the catalyst may not be required  
10 to convert nitric oxide to nitrogen and oxygen, e.g., when an alcohol is used  
11 as the fuel. In this case the catalyst is called an oxidation catalyst. Because of  
12 the relatively low temperature of the engine exhaust stream and the first  
13 exhaust stream, this catalyst does not function at a very high efficiency,  
14 thereby necessitating the molecular sieve bed.

15  
16 When the molecular sieve bed reaches a sufficient temperature,  
17 typically about 150-200° C., the pollutants which are adsorbed in the bed  
18 begin to desorb and are carried by the first exhaust stream over the catalyst.  
19 At this point the catalyst has reached its operating temperature and is  
20 therefore capable of fully converting the pollutants to innocuous components.

21  
22 The adsorbent bed used in the instant invention can be conveniently  
23 employed in particulate form or the adsorbent can be deposited onto a solid  
24 monolithic carrier. When particulate form is desired, the adsorbent can be  
25 formed into shapes such as pills, pellets, granules, rings, spheres, etc. In the  
26 employment of a monolithic form, it is usually most convenient to employ the  
27 adsorbent as a thin film or coating deposited on an inert carrier material which  
28 provides the structural support for the adsorbent. The inert carrier material  
29 can be any refractory material such as ceramic or metallic materials. It is  
30 desirable that the carrier material be unreactive with the adsorbent and not be  
31 degraded by the gas to which it is exposed. Examples of suitable ceramic  
32 materials include sillimanite, petalite, cordierite, mullite, zircon, zircon mullite,  
33 spondumene, alumina-titanate, etc. Additionally, metallic materials which are

1 within the scope of this invention include metals and alloys as disclosed in  
2 U.S. Pat. No. 3,920,583 which are oxidation resistant and are otherwise  
3 capable of withstanding high temperatures.  
4

5 The carrier material can best be utilized in any rigid unitary  
6 configuration which provides a plurality of pores or channels extending in the  
7 direction of gas flow. The configuration may be a honeycomb configuration.  
8 The honeycomb structure can be used advantageously in either unitary form,  
9 or as an arrangement of multiple modules. The honeycomb structure is  
10 usually oriented such that gas flow is generally in the same direction as the  
11 cells or channels of the honeycomb structure. For a more detailed discussion  
12 of monolithic structures, refer to U.S. Pat. Nos. 3,785,998 and 3,767,453.  
13

14 The molecular sieve is deposited onto the carrier by any convenient  
15 way well known in the art. A desirable method involves preparing a slurry  
16 using the molecular sieve and coating the monolithic honeycomb carrier with  
17 the slurry. The slurry can be prepared by means known in the art such as  
18 combining the appropriate amount of the molecular sieve and a binder with  
19 water. This mixture is then blended by using means such as sonification,  
20 milling, etc. This slurry is used to coat a monolithic honeycomb by dipping the  
21 honeycomb into the slurry, removing the excess slurry by draining or blowing  
22 out the channels, and heating to about 100° C. If the desired loading of  
23 molecular sieve is not achieved, the above process may be repeated as many  
24 times as required to achieve the desired loading.  
25

26 Instead of depositing the molecular sieve onto a monolithic honeycomb  
27 structure, one can take the molecular sieve and form it into a monolithic  
28 honeycomb structure by means known in the art.  
29

30 The adsorbent may optionally contain one or more catalytic metals  
31 dispersed thereon. The metals which can be dispersed on the adsorbent are  
32 the noble metals which consist of platinum, palladium, rhodium, ruthenium,  
33 and mixtures thereof. The desired noble metal may be deposited onto the

1 adsorbent, which acts as a support, in any suitable manner well known in the  
2 art. One example of a method of dispersing the noble metal onto the  
3 adsorbent support involves impregnating the adsorbent support with an  
4 aqueous solution of a decomposable compound of the desired noble metal or  
5 metals, drying the adsorbent which has the noble metal compound dispersed  
6 on it and then calcining in air at a temperature of about 400° to about 500° C.  
7 for a time of about 1 to about 4 hours. By decomposable compound is meant  
8 a compound which upon heating in air gives the metal or metal oxide.  
9 Examples of the decomposable compounds which can be used are set forth  
10 in U.S. Pat. No. 4,791,091. Examples of decomposable compounds are  
11 chloroplatinic acid, rhodium trichloride, chloropalladic acid, hexachloroiridate  
12 (IV) acid and hexachlororuthenate. It is typical that the noble metal be present  
13 in an amount ranging from about 0.01 to about 4 weight percent of the  
14 adsorbent support. Specifically, in the case of platinum and palladium the  
15 range is 0.1 to 4 weight percent, while in the case of rhodium and ruthenium  
16 the range is from about 0.01 to 2 weight percent.

17  
18 These catalytic metals are capable of oxidizing the hydrocarbon and  
19 carbon monoxide and reducing the nitric oxide components to innocuous  
20 products. Accordingly, the adsorbent bed can act both as an adsorbent and  
21 as a catalyst.

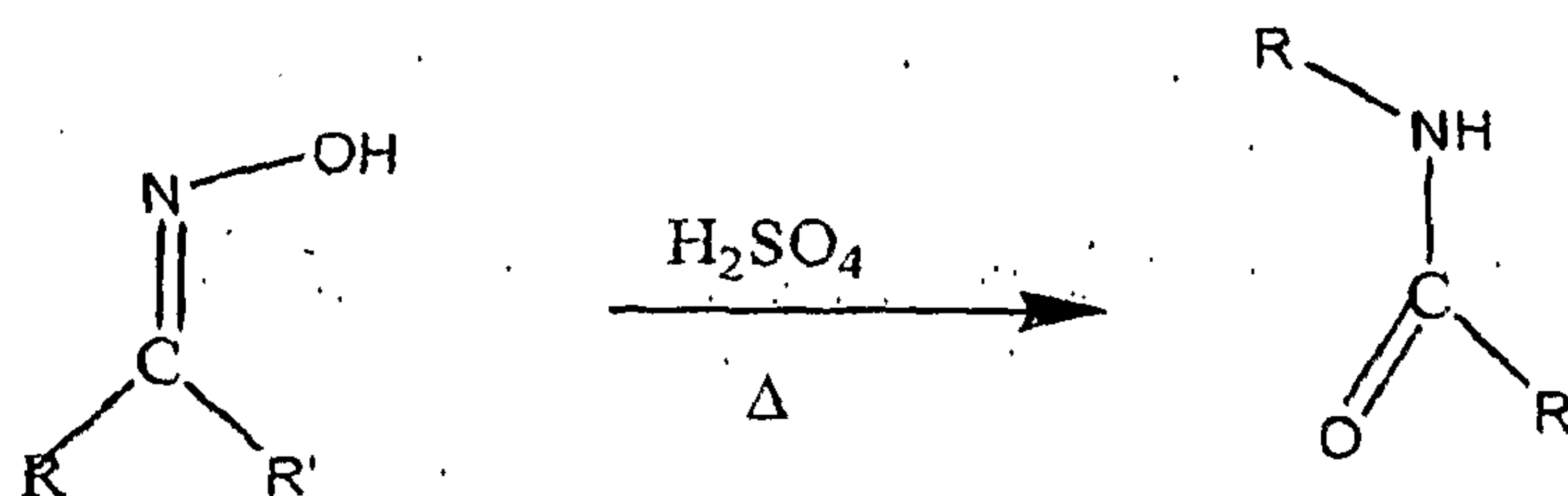
22  
23 The catalyst which is used in this invention is selected from any three  
24 component control or oxidation catalyst well known in the art. Examples of  
25 catalysts are those described in U.S. Pat. Nos. 4,528,279; 4,791,091;  
26 4,760,044; 4,868,148; and 4,868,149. Desirable catalysts well known in the  
27 art are those that contain platinum and rhodium and optionally palladium,  
28 while oxidation catalysts usually do not contain rhodium. Oxidation catalysts  
29 usually contain platinum and/or palladium metal. These catalysts may also  
30 contain promoters and stabilizers such as barium, cerium, lanthanum, nickel,  
31 and iron. The noble metals promoters and stabilizers are usually deposited on  
32 a support such as alumina, silica, titania, zirconia, alumino silicates, and  
33 mixtures thereof with alumina

1 being desirable. The catalyst can be conveniently employed in particulate  
2 form or the catalytic composite can be deposited on a solid monolithic carrier  
3 with a monolithic carrier being desirable. The particulate form and monolithic  
4 form of the catalyst are prepared as described for the adsorbent above.

5  
6 The molecular sieve used in the adsorbent bed is SSZ-74.

### 8 Beckmann Rearrangement

9  
10 The present invention relates to a process for the preparation of  
11 amides from oximes. The present invention further relates to the use of SSZ-  
12 74 in the catalytic transformation of oximes, such as cyclohexanone oxime, to  
13 amides, such as epsilon-caprolactam (caprolactam), also known as  
14 Beckmann catalytic rearrangement. The Beckmann rearrangement is shown  
15 below (where sulfuric acid is used instead of a molecular sieve catalyst).



20 Amides, and in particular caprolactam, are known in literature as  
21 important intermediates for chemical syntheses and as raw materials for the  
22 preparation of polyamide resins.

23  
24 Caprolactam is produced industrially by cyclohexanone oxime  
25 rearrangement in liquid phase using sulfuric acid or oleum. The rearranged  
26 product is neutralized with ammonia causing the joint formation of ammonium  
27 sulfate. This technology has numerous problems linked to the use of sulfuric  
28 acid, to the formation of high quantities of ammonium sulfate, with relative  
29 problems of disposal, corrosion of the equipment owing to the presence of  
30 acid vapors, etc.

1  
2       Alternative processes have been proposed in the literature for the  
3 catalytic rearrangement of cyclohexanone oxime into caprolactam, in which  
4 solids of an acid nature are used, as catalysts, selected from derivatives of  
5 boric acid, zeolites, non-zeolitic molecular sieves, solid phosphoric acid,  
6 mixed metal oxides, etc.

7  
8       In particular, European patent 234.088 describes a method for  
9 preparing caprolactam which comprises putting cyclohexanone oxime in  
10 gaseous state in contact with alumino-silicates of the zeolitic type such as  
11 ZSM-5, ZSM-11 or ZSM-23 having a "Constraint Index" of between 1 and 12,  
12 an atomic ratio Si/Al of at least 500 ( $\text{SiO}_2/\text{Al}_2\text{O}_3$  mole ratio of at least 1,000)  
13 and an external acid functionality of less than 5 micro equivalents/g.

14  
15       Zeolites, as described in "Zeolite Molecular Sieves" D. W. Breck, John  
16 Wiley & Sons, (1974) or in "Nature" 381 (1996), 295, are crystalline products  
17 characterized by the presence of a regular microporosity, with channels  
18 having dimensions of between 3 and 10 Angstroms. In some particular zeolitic  
19 structures there can be cavities with greater dimensions, of up to about 13  
20 Angstroms.

21  
22       With the aim of providing another method for the preparation of  
23 amides, and in particular of caprolactam, a new process has now been found  
24 which uses a catalyst comprising SSZ-74. The present invention therefore  
25 relates to a process for the preparation of amides via the catalytic  
26 rearrangement of oximes which comprises putting an oxime in vapor phase in  
27 contact with a catalyst comprising a crystalline molecular sieve having a mole  
28 ratio greater than about 15 of (1) an oxide of a first tetravalent element to (2)  
29 an oxide of a trivalent element, pentavalent element, second tetravalent  
30 element which is different from said first tetravalent element or mixture thereof  
31 and having, after calcination, the X-ray diffraction lines of Table II. The  
32 molecular sieve may have a mole ratio greater than about 15 of (1) silicon

1 oxide to (2) an oxide selected from aluminum oxide, gallium oxide, iron oxide,  
2 boron oxide, titanium oxide, indium oxide and mixtures thereof.

3

4 Other methods for converting oximes to amides via Beckmann  
5 rearrangement are disclosed in U.S. Patent No. 4,883,915, issued November  
6 28, 1989 to McMahon, which uses a crystalline borosilicate molecular sieve in  
7 the catalyst and U.S. Patent No. 5,942,613, issued August 24, 1999 to Carati  
8 et al., which uses a mesoporous silica-alumina in the catalyst.

9

10 According to the present invention a desirable amide is epsilon-  
11 caprolactam (caprolactam) and the desirable oxime is cyclohexanone oxime  
12 (CEOX). In particular, the catalytic rearrangement of the cyclohexanone  
13 oxime takes place at a pressure of between 0.05 and 10 bars and at a  
14 temperature of between 250°C and 500°C., for example between 300°C and  
15 450°C. More specifically, the cyclohexanone oxime, in vapor phase, is fed to  
16 the reactor containing the catalyst in the presence of a solvent and optionally  
17 an incondensable gas. The cyclohexanone oxime is dissolved in the solvent  
18 and the mixture thus obtained is then vaporized and fed to the reactor. The  
19 solvent should be essentially inert to the oxime and the amide, as well as the  
20 catalyst. Useful solvents include, but are not limited to, lower boiling  
21 hydrocarbons, alcohols and ethers.

22

23 Desirable solvents are of the type  $R^1 - O - R^2$  wherein  $R^1$  is a  $C_1 - C_4$  alkyl  
24 chain and  $R^2$  can be a hydrogen atom or an alkyl chain containing a number  
25 of carbon atoms less than or equal to  $R^1$ . These solvents can be used alone  
26 or mixed with each other or combined with an aromatic hydrocarbon such as  
27 benzene or toluene. Alcohols with a  $C_1 - C_2$  alkyl chain are particularly  
28 desirable.

29

30 The cyclohexanone oxime is fed to the rearrangement reactor with a weight  
31 ratio with respect to the catalyst which is such as to give a WHSV (Weight

Hourly Space Velocity), expressed as Kg of cyclohexanone oxime/kg of catalyst/time, of between 0.1 and 50 hr.<sup>-1</sup>, for example between 0.5 and 20 hr.<sup>-1</sup>.

The deterioration of the catalyst is due to the formation of organic residues which obstruct the pores of the catalyst and poison its active sites. The deterioration process is slow and depends on the operating conditions and in particular the space velocity, solvent, temperature, composition of the feeding. The catalytic activity however can be efficiently reintegrated by the combustion of the residues, by treatment in a stream of air and nitrogen at a temperature of between 450°C and 600°C.

### EXAMPLES

The following examples demonstrate but do not limit the present invention.

#### Example 1

##### Synthesis of Hexamethylene-1,6-bis-(N-methyl-N-pyrrolidinium) dication SDA

In 50 ml of acetone was dissolved 5ml (48 mmoles) of N-methyl pyrrolidine. 4.9 Grams of 1,6 dibromohexane (20 mmoles) were added and the resulting mixture was stirred at room temperature for three days. Solids formed and were collected by filtration and washed with ether and kept in a vacuum oven. Then 3.71 grams of the dried solid was mixed into 18.7 grams of water and 9.57 grams of AG1-X8 resin for exchange to the OH form. The exchange was run overnight and then the solution was collected and titrated.

#### Example 2

##### Synthesis of All-Silica SSZ-74

6.4 Grams of the solution from Example 1 (3 mmoles) was mixed in a tared Teflon cup with 1.26 grams of tetraethyl orthosilicate and then allowed

1 to evaporate (in a hood) for several days as hydrolysis occurred. A second  
2 reaction was set up the same way. After evaporation to the appearance of  
3 dryness, one reaction was given 0.20 gram of water and mixed. The second  
4 was given 0.60 gram of water and the same treatment ensued. 0.125 Gram of  
5 about 50% HF was carefully added to each reaction mixture and the contents  
6 were stirred with a plastic spatula and a thick gel formed. In the first case the  
7 H<sub>2</sub>O/SiO<sub>2</sub> ratio was now roughly 3.5 and it was 7.0 in the second case. The  
8 materials were heated to 150° C and at 43 RPM in tumbled Parr reactors  
9 placed in a Blue M convection heating oven. The reactions were cooled and  
10 opened in 6 day periods with a small amount examined by Scanning Electron  
11 Microscopy to determine if crystals had formed. After 22 days there was  
12 crystalline material in both and the solids were collected (filtration) and  
13 washed with copious amounts of water, air dried and then examined by X-ray  
14 diffraction (XRD). The product in both cases was SSZ-74.

15

16

### Example 3

17

#### Calcination of SSZ-74

18

19

20

21

22

23

24

25

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33

The products from both reactions in Example 2 were calcined in stages  
and in air to 595° C to remove the organic content. The materials were found  
to be stable and the XRD patterns showed the relationship to the as-made  
SSZ-74.

23

24

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### Example 4

#### Adsorption of 2,2-Dimethylbutane

26

27

28

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32

33

The calcined material of Example 3 was then tested for the uptake of  
the hydrocarbon 2,2-dimethylbutane. This adsorbate does not enter small  
pore zeolites (8-ring portals) and sometimes is hindered in entering  
intermediate pore zeolites like ZSM-5. The SSZ-74 showed a profile more  
characteristic of intermediate pore materials (as contrasted to Y zeolite, a  
large pore material), showing steady gradual uptake of the adsorbate.

1 SSZ-74 was shown to adsorb about 0.08 cc/gram after 3 hours of  
2 exposure to the 2,2 dimethyl butane adsorbate using a pulsed mode. This  
3 value compares with an analysis for ZSM-5 zeolite which gives a value closer  
4 to 0.07cc/gm at the same point in time under the same experimental  
5 conditions. This would indicate that the pores of SSZ-74 are at least 10-rings

#### 6 7 Example 5

#### 8 Synthesis of Aluminosilicate SSZ-74

9  
10 The synthesis parameters of Example 2 were repeated except for the  
11 following changes. (1) 0.04 gram of Y zeolite material LZ-210 was added as a  
12 potential contributor of Al; (2) the initial H<sub>2</sub>O/SiO<sub>2</sub> ratio for the synthesis was  
13 adjusted to 5; (3) seeds of a successful SSZ-74 product were added; and (4)  
14 the reaction was run at 170° C. After 9 days there was crystalline material  
15 which was SSZ-74 when worked up and analyzed by XRD. The solids were  
16 calcined then as in Example 3.

#### 17 18 Example 6

#### 19 Constraint Index

20  
21 0.12 grams of the material from Example 5, in a 20-40 pelleted and  
22 meshed range, was loaded into a stainless steel reactor and run in a  
23 Constraint Index test (50/50 n-hexane/3-methylpentane). The normal feed  
24 rate was used (8 µl/min.) and the test was run at 700° F. after the catalyst had  
25 been dried in the reactor to near 1000° F. Helium flow was used. At 10  
26 minutes on-stream nearly 30% of the feed was being converted with about  
27 equal amounts of each reactant. The selectivity did not change as the catalyst  
28 fouled to half the conversion at 100 minutes. The pores of the active SSZ-74  
29 were at least intermediate in size.  
30

## Example 7

Synthesis of Aluminosilicate SSZ-74

Three mMoles of SDA solution and 1.26 grams ( 6 mMoles ) of tetraethylorthosilicate were combined in a Teflon cup for a Parr reactor. The contents were allowed to react and then most of the water and then the ethanol by-product were allowed to evaporate in a hood over several days. Once the H<sub>2</sub>O/SiO<sub>2</sub> ratio was about 5, from the evaporation, 0.04 grams of LZ-210 zeolite were added (LZ-210 is a Y zeolite which has been treated with (NH<sub>4</sub><sup>+</sup>)<sub>2</sub>SiF<sub>6</sub> to provide some de-alumination). A few mg of seeds of SSZ-74 were added in the as-made state. Lastly, 0.132 gram of 50% HF was added and the reactor was closed up and heated at 170°C, 43 RPM, for six days. A sample of the cooled reaction product showed nicely crystalline material in an electron microscope. The reaction contents were worked up and dried. Analysis by X-ray diffraction showed the product to be molecular sieve SSZ-74.

The sample was calcined ( in air to 595°C ) and then pelleted and meshed (20-40) and run in a standard Constraint Index test. At 700°F the initial conversion was 28% with a CI value of 1.1. With time-on-stream the catalyst showed a steady deactivation while the CI value did not change much.

1 **WHAT IS CLAIMED IS:**

2

- 3 1. A crystalline molecular sieve having a mole ratio greater than about 15 of  
 4 (1) an oxide of a first tetravalent element to (2) an oxide of a trivalent  
 5 element, pentavalent element, second tetravalent element which is  
 6 different from said first tetravalent element or mixture thereof and having,  
 7 after calcination, the X-ray diffraction lines shown in Table II below:

8

9

10

| <u>TABLE II</u>              |                              |                                          |
|------------------------------|------------------------------|------------------------------------------|
| <u>Calcined SSZ-74</u>       |                              |                                          |
| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              |                                          |

11

12

- 13 2. The molecular sieve of claim 1 wherein the molecular sieve has a mole  
 14 ratio greater than about 15 of (1) silicon oxide to (2) an oxide selected  
 15 from aluminum oxide, gallium oxide, iron oxide, boron oxide, titanium  
 16 oxide, indium oxide and mixtures thereof.

17

- 18 3. A crystalline molecular sieve having a composition comprising, as  
 19 synthesized and in the anhydrous state, in terms of mole ratios, the  
 20 following:

21

$$\text{SiO}_2 / \text{X}_c\text{O}_d \quad \text{greater than 100}$$

22

$$\text{M}_{2/n} / \text{SiO}_2 \quad 0 - 0.03$$

23

$$\text{Q} / \text{SiO}_2 \quad 0.30 - 0.70$$

24

$$\text{F} / \text{SiO}_2 \quad 0.30 - 0.70$$

wherein X is aluminum, gallium, iron, boron, titanium, indium and mixtures thereof, c is 1 or 2; d is 2 when c is 1, or d is 3 or 5 when c is 2, M is an alkali metal cation, alkaline earth metal cation or mixtures thereof; n is the valence of M; Q is a hexamethylene-1,6-bis-(N-methyl-N-pyrrolidinium) dication and F is fluoride, and

wherein the crystalline molecular sieve has, after calcination, the X-ray diffraction lines shown in Table II below:

TABLE II

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |

<sup>(a)</sup>  $\pm 0.1$

4. A method of preparing a crystalline molecular sieve, said method comprising contacting under crystallization conditions (1) a source of silicon oxide, (2) a source of aluminum oxide, gallium oxide, iron oxide, boron oxide, titanium oxide, indium oxide and mixtures thereof, (3) fluoride ions and (4) a structure directing agent comprising a hexamethylene-1,6-bis-(N-methyl-N-pyrrolidinium) dication, and wherein the crystalline molecular sieve has, after calcination, the X-ray diffraction lines shown in Table II below:

TABLE II

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              |                                          |

5. The method of claim 4 wherein the crystalline molecular sieve is prepared from a reaction mixture comprising silicon oxide and, in terms of mole ratios, the following:

|                                       |                 |
|---------------------------------------|-----------------|
| $\text{SiO}_2 / \text{X}_a\text{O}_b$ | 100 and greater |
| $\text{OH}^- / \text{SiO}_2$          | 0.20 – 0.80     |
| $\text{Q} / \text{SiO}_2$             | 0.20 – 0.80     |
| $\text{M}_{2/n} / \text{SiO}_2$       | 0 – 0.04        |
| $\text{H}_2\text{O} / \text{SiO}_2$   | 2 - 10          |
| $\text{HF} / \text{SiO}_2$            | 0.20 – 0.80     |

wherein X is aluminum, gallium, iron, boron, titanium, indium and mixtures thereof, a is 1 or 2, b is 2 when a is 1, b is 3 when a is 2, M is an alkali metal cation, alkaline earth metal cation or mixtures thereof; n is the valence of M and Q is a hexamethylene-1,6-bis-(N-methyl-N-pyrrolidinium) dication.

6. The method of claim 5 wherein the reaction mixture comprises

|   |                                       |                 |
|---|---------------------------------------|-----------------|
| 1 |                                       |                 |
| 2 | $\text{SiO}_2 / \text{X}_a\text{O}_b$ | 100 and greater |
| 3 | $\text{OH}^- / \text{SiO}_2$          | 0.40 – 0.60     |
| 4 | $\text{Q} / \text{SiO}_2$             | 0.40 – 0.60     |
| 5 | $\text{M}_{2/n} / \text{SiO}_2$       | 0 – 0.025       |
| 6 | $\text{H}_2\text{O} / \text{SiO}_2$   | 3 - 7           |
| 7 | $\text{HF} / \text{SiO}_2$            | 0.30 – 0.60.    |
| 8 |                                       |                 |

9 7. A process for converting hydrocarbons comprising contacting a  
 10 hydrocarbonaceous feed at hydrocarbon converting conditions with a  
 11 catalyst comprising a crystalline molecular sieve having a mole ratio  
 12 greater than about 15 of (1) an oxide of a first tetravalent element to (2)  
 13 an oxide of a trivalent element, pentavalent element, second tetravalent  
 14 element which is different from said first tetravalent element or mixture  
 15 thereof and having, after calcination, the X-ray diffraction lines shown in  
 16 Table II below:

18 TABLE II

19 Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              |                                          |

20

21

22 8. The process of Claim 7 wherein the molecular sieve has a mole ratio  
 23 greater than about 15 of (1) silicon oxide to (2) an oxide selected from

- 1 aluminum oxide, gallium oxide, iron oxide, boron oxide, titanium oxide,  
2 indium oxide and mixtures thereof.  
3
- 4 9. The process of Claim 8 wherein the molecular sieve is substantially free  
5 of acidity.  
6
- 7 10. The process of Claim 8 wherein the process is a hydrocracking process  
8 comprising contacting the catalyst with the hydrocarbon feedstock under  
9 hydrocracking conditions.  
10
- 11 11. The process of Claim 8 wherein the process is a dewaxing process  
12 comprising contacting the catalyst with the hydrocarbon feedstock under  
13 dewaxing conditions.  
14
- 15 12. The process of Claim 8 wherein the process is a process for improving  
16 the viscosity index of a dewaxed product of waxy hydrocarbon feeds  
17 comprising contacting the catalyst with a waxy hydrocarbon feed under  
18 isomerization dewaxing conditions.  
19
- 20 13. The process of Claim 8 wherein the process is a process for producing a  
21 C<sub>20+</sub> lube oil from a C<sub>20+</sub> olefin feed comprising isomerizing said olefin  
22 feed under isomerization conditions over the catalyst.  
23
- 24 14. The process of Claim 13 wherein the catalyst further comprises at least  
25 one Group VIII metal.  
26
- 27 15. The process of Claim 8 wherein the process is a process for catalytically  
28 dewaxing a hydrocarbon oil feedstock boiling above about 350°F (177°C)  
29 and containing straight chain and slightly branched chain hydrocarbons  
30 comprising contacting said hydrocarbon oil feedstock in the presence of  
31 added hydrogen gas at a hydrogen pressure of about 15-3000 psi  
32 (0.103-20.7 MPa) under dewaxing conditions with the catalyst.

1

2 16. The process of Claim 15 wherein the catalyst further comprises at least  
3 one Group VIII metal.

4

5 17. The process of Claim 15 wherein said catalyst comprises a layered  
6 catalyst comprising a first layer comprising the molecular sieve and at  
7 least one Group VIII metal, and a second layer comprising an  
8 aluminosilicate zeolite which is more shape selective than the molecular  
9 sieve of said first layer.

10

11 18. The process of Claim 8 wherein the process is a process for preparing a  
12 lubricating oil which comprises:

13

14 hydrocracking in a hydrocracking zone the hydrocarbonaceous feedstock  
15 to obtain an effluent comprising a hydrocracked oil; and

16

17 catalytically dewaxing said effluent comprising hydrocracked oil at a  
18 temperature of at least about 400°F (204°C) and at a pressure of from  
19 about 15 psig to about 3000 psig (0.103 to 20.7 MPa gauge) in the  
20 presence of added hydrogen gas with the catalyst.

21

22 19. The process of Claim 18 wherein the catalyst further comprises at least  
23 one Group VIII metal.

24

25 20. The process of Claim 8 wherein the process is a process for  
26 isomerization dewaxing a raffinate comprising contacting said raffinate in  
27 the presence of added hydrogen under isomerization dewaxing  
28 conditions with the catalyst.

29

30 21. The process of Claim 20 wherein the catalyst further comprises at least  
31 one Group VIII metal.

32

- 1 22. The process of Claim 20 wherein the raffinate is bright stock.  
2
- 3 23. The process of Claim 8 wherein the process is a process for increasing  
4 the octane of the hydrocarbon feedstock to produce a product having an  
5 increased aromatics content comprising contacting the  
6 hydrocarbonaceous feedstock which comprises normal and slightly  
7 branched hydrocarbons having a boiling range above about 40°C and  
8 less than about 200°C under aromatic conversion conditions with the  
9 catalyst.  
10
- 11 24. The process of Claim 23 wherein the molecular sieve is substantially free  
12 of acidity.  
13
- 14 25. The process of Claim 23 wherein the molecular sieve contains a  
15 Group VIII metal component.  
16
- 17 26. The process of Claim 8 wherein the process is a catalytic cracking  
18 process comprising contacting the hydrocarbon feedstock in a reaction  
19 zone under catalytic cracking conditions in the absence of added  
20 hydrogen with the catalyst.  
21
- 22 27. The process of Claim 26 wherein the catalyst additionally comprises a  
23 large pore crystalline cracking component.  
24
- 25 28. The process of Claim 8 wherein the process is an isomerization process  
26 for isomerizing C<sub>4</sub> to C<sub>7</sub> hydrocarbons, comprising contacting a feed  
27 having normal and slightly branched C<sub>4</sub> to C<sub>7</sub> hydrocarbons under  
28 isomerizing conditions with the catalyst.  
29
- 30 29. The process of Claim 28 wherein the molecular sieve has been  
31 impregnated with at least one Group VIII metal.  
32

- 1 30. The process of Claim 28 wherein the catalyst has been calcined in a  
2 steam/air mixture at an elevated temperature after impregnation of the  
3 Group VIII metal.  
4
- 5 31. The process of Claim 29 wherein the Group VIII metal is platinum.  
6
- 7 32. The process of Claim 8 wherein the process is a process for alkylating  
8 an aromatic hydrocarbon which comprises contacting under alkylation  
9 conditions at least a molar excess of an aromatic hydrocarbon with a C<sub>2</sub>  
10 to C<sub>20</sub> olefin under at least partial liquid phase conditions and in the  
11 presence of the catalyst.  
12
- 13 33. The process of Claim 32 wherein the olefin is a C<sub>2</sub> to C<sub>4</sub> olefin.  
14
- 15 34. The process of Claim 33 wherein the aromatic hydrocarbon and olefin  
16 are present in a molar ratio of about 4:1 to about 20:1, respectively.  
17
- 18 35. The process of Claim 33 wherein the aromatic hydrocarbon is selected  
19 from the group consisting of benzene, toluene, ethylbenzene, xylene,  
20 naphthalene, naphthalene derivatives, dimethylnaphthalene, and  
21 mixtures thereof.  
22
- 23 36. The process of Claim 8 wherein the process is a process for  
24 transalkylating an aromatic hydrocarbon which comprises contacting  
25 under transalkylating conditions an aromatic hydrocarbon with a polyalkyl  
26 aromatic hydrocarbon under at least partial liquid phase conditions and  
27 in the presence of the catalyst.  
28
- 29 37. The process of Claim 7, 10, 11, 12, 13, 15, 18, 20, 26, 28, 32 or 36  
30 wherein the molecular sieve is predominantly in the hydrogen form.  
31

- 1 38. The process of Claim 36 wherein the aromatic hydrocarbon and the  
2 polyalkyl aromatic hydrocarbon are present in a molar ratio of from about  
3 1:1 to about 25:1, respectively.  
4
- 5 39. The process of Claim 36 wherein the aromatic hydrocarbon is selected  
6 from the group consisting of benzene, toluene, ethylbenzene, xylene,  
7 and mixtures thereof.  
8
- 9 40. The process of Claim 36 wherein the polyalkyl aromatic hydrocarbon is a  
10 dialkylbenzene.  
11
- 12 41. The process of Claim 8 wherein the process is a process to convert  
13 paraffins to aromatics which comprises contacting paraffins under  
14 conditions which cause paraffins to convert to aromatics with a catalyst  
15 comprising the molecular sieve and gallium, zinc, or a compound of  
16 gallium or zinc.  
17
- 18 42. The process of Claim 8 wherein the process is a process for isomerizing  
19 olefins comprising contacting said olefin under conditions which cause  
20 isomerization of the olefin with the catalyst.  
21
- 22 43. The process of Claim 8 wherein the process is a process for isomerizing  
23 an isomerization feed comprising an aromatic C<sub>8</sub> stream of xylene  
24 isomers or mixtures of xylene isomers and ethylbenzene, wherein a  
25 more nearly equilibrium ratio of ortho-, meta and para-xylenes is  
26 obtained, said process comprising contacting said feed under  
27 isomerization conditions with the catalyst.  
28
- 29 44. The process of Claim 8 wherein the process is a process for  
30 oligomerizing olefins comprising contacting an olefin feed under  
31 oligomerization conditions with the catalyst.  
32

- 1 45. The process of Claim 8 wherein the process is a process for the  
2 production of higher molecular weight hydrocarbons from lower  
3 molecular weight hydrocarbons comprising the steps of:  
4  
5 (a) introducing into a reaction zone a lower molecular weight  
6 hydrocarbon-containing gas and contacting said gas in said zone under  
7 C<sub>2</sub>+ hydrocarbon synthesis conditions with the catalyst and a metal or  
8 metal compound capable of converting the lower molecular weight  
9 hydrocarbon to a higher molecular weight hydrocarbon; and  
10  
11 (b) withdrawing from said reaction zone a higher molecular weight  
12 hydrocarbon-containing stream.  
13
- 14 46. The process of Claim 45 wherein the metal or metal compound  
15 comprises a lanthanide or actinide metal or metal compound.  
16
- 17 47. The process of Claim 45 wherein the lower molecular weight  
18 hydrocarbon is methane.  
19
- 20 48. A catalyst composition for promoting polymerization of 1-olefins, said  
21 composition comprising  
22  
23 (A) a crystalline molecular sieve having a mole ratio greater than about  
24 15 of (1) an oxide of a first tetravalent element to (2) an oxide of a  
25 trivalent element, pentavalent element, second tetravalent element which  
26 is different from said first tetravalent element or mixture thereof and  
27 having, after calcination, the X-ray diffraction lines shown in Table II  
28 below:

TABLE II

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              |                                          |

; and

(B) an organotitanium or organochromium compound.

49. The process of Claim 7 wherein the process is a process for polymerizing 1-olefins, which process comprises contacting 1-olefin monomer with a catalytically effective amount of a catalyst composition comprising

(A) said crystalline molecular sieve; and

(B) an organotitanium or organochromium compound,

under polymerization conditions which include a temperature and pressure suitable for initiating and promoting the polymerization reaction.

50. The process of Claim 49 wherein the 1-olefin monomer is ethylene.

51. The process of Claim 8 wherein the process is a process for hydrogenating a hydrocarbon feed containing unsaturated hydrocarbons, the process comprising contacting the feed with hydrogen under conditions which cause hydrogenation with the catalyst.

52. The process of Claim 51 wherein the catalyst contains metals, salts or complexes wherein the metal is selected from the group consisting of

1 platinum, palladium, rhodium, iridium or combinations thereof, and the  
 2 group consisting of nickel, molybdenum, cobalt, tungsten, titanium,  
 3 chromium, vanadium, rhenium, manganese, and combinations thereof.

4  
 5 53. A process for converting oxygenated hydrocarbons comprising  
 6 contacting said oxygenated hydrocarbon under conditions to produce  
 7 liquid products with a catalyst comprising a molecular sieve having a  
 8 mole ratio greater than about 15 of an oxide of a first tetravalent element  
 9 to an oxide of a second tetravalent element which is different from said  
 10 first tetravalent element, trivalent element, pentavalent element or  
 11 mixture thereof and having, after calcination, the X-ray diffraction lines  
 12 shown in Table II below:

TABLE II

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              |                                          |

15  
 16  
 17 54. The process of Claim 53 wherein the oxygenated hydrocarbon is a lower  
 18 alcohol.

19  
 20 55. The process of Claim 54 wherein the lower alcohol is methanol.

21  
 22  
 23 56. A process for hydrotreating a hydrocarbon feedstock comprising  
 24 contacting the feedstock with a hydrotreating catalyst and hydrogen

under hydrotreating conditions, wherein the catalyst comprises a crystalline molecular sieve having a mole ratio greater than about 15 of (1) an oxide of a first tetravalent element to (2) an oxide of a trivalent element, pentavalent element, second tetravalent element which is different from said first tetravalent element or mixture thereof and having, after calcination, the X-ray diffraction lines shown in Table II below:

TABLE II

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| <sup>(a)</sup> ± 0.1         |                              |                                          |

57. The process of Claim 56 wherein the catalyst contains a Group VIII metal or compound, a Group VI metal or compound or combinations thereof.

58. A process for the reduction of oxides of nitrogen contained in a gas stream wherein said process comprises contacting the gas stream with a crystalline molecular sieve having a mole ratio greater than about 15 of (1) an oxide of a first tetravalent element to (2) an oxide of a trivalent element, pentavalent element, second tetravalent element which is different from said first tetravalent element or mixture thereof and having, after calcination, the X-ray diffraction lines shown in Table II below:

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24

TABLE IICalcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              |                                          |

59. The process of Claim 58 conducted in the presence of oxygen.

60. The process of Claim 58 wherein said molecular sieve contains a metal or metal ions capable of catalyzing the reduction of the oxides of nitrogen.

61. The process of Claim 60 wherein the metal is cobalt, copper, platinum, iron, chromium, manganese, nickel, zinc, lanthanum, palladium, rhodium or mixtures thereof.

62. The process of Claim 58 wherein the gas stream is the exhaust stream of an internal combustion engine.

63. The process of Claim 61 wherein the gas stream is the exhaust stream of an internal combustion engine.

64. A process for oxidation of hydrocarbons comprising contacting said hydrocarbon with an oxidizing agent in the presence of a catalytically effective amount of a titanium-containing molecular sieve for a time and

at a temperature effective to oxidize said hydrocarbon, wherein the titanium-containing molecular sieve is a molecular sieve having a mole ratio greater than about 15 of (1) silicon oxide to (2) titanium oxide and having, after calcination, the X-ray diffraction lines shown in Table II below:

TABLE II

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |

(a)  $\pm 0.1$

65. A process for epoxidation of an olefin comprising contacting said olefin with hydrogen peroxide in the presence of a catalytically effective amount of a titanium-containing molecular sieve for a time and at a temperature effective to epoxidize said olefin, wherein the titanium-containing molecular sieve is a molecular sieve having a mole ratio greater than about 15 of (1) silicon oxide to (2) titanium oxide and having, after calcination, the X-ray diffraction lines shown in Table II below:

1  
2  
3TABLE IICalcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |

4  
5<sup>(a)</sup> ± 0.1

66. A process for oxidizing cyclohexane comprising contacting said cyclohexane with hydrogen peroxide in the presence of a catalytically effective amount of a titanium-containing molecular sieve for a time and at a temperature effective to oxidize said cyclohexane, wherein the titanium-containing molecular sieve is a molecular sieve having a mole ratio greater than about 15 of (1) silicon oxide to (2) titanium oxide and having, after calcination, the X-ray diffraction lines shown in Table II below:

14  
15TABLE IICalcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |

(a)  $\pm 0.1$

67. A catalytic oxidation process comprising contacting under oxidation conditions (1) a reactant which is catalytically oxidizable in the presence of hydrogen peroxide, (2) aqueous hydrogen peroxide and (3) a catalytically effective amount of an oxidation catalyst comprising a molecular sieve having a mole ratio greater than about 15 of (1) silicon oxide to (2) titanium oxide and having, after calcination, the X-ray diffraction lines shown in Table II below:

TABLE II

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |

(a)  $\pm 0.1$

68. The process of Claim 67 wherein the oxidizable reactant is a hydrocarbon.

69. A process for the epoxidation of an olefin comprising contacting said olefin with hydrogen peroxide in the presence of a catalytically effective amount of a catalyst comprising a molecular sieve having a mole ratio greater than about 15 of (1) silicon oxide to (2) titanium oxide and having, after calcination, the X-ray diffraction lines shown in Table II below:

TABLE II

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              |                                          |

70. A method for performing an acylation reaction on an aromatic substrate  $\text{ArH}_n$  to form a product  $\text{ArH}_{n-1}\text{COR}$ , the method comprising the steps of:
- providing the aromatic substrate,
- intimately mixing the substrate and an acylating agent, wherein the acylating agent is selected from the group consisting of a carboxylic acid derivative, a carboxylic acid, an acid anhydride, an ester, and an acyl halide, and
- exposing an intimate mixture thus formed to a catalyst comprising a crystalline molecular sieve having a mole ratio greater than about 15 of (1) an oxide of a first tetravalent element to (2) an oxide of a trivalent element, pentavalent element, second tetravalent element which is different from said first tetravalent element or mixture thereof and having, after calcination, the X-ray diffraction lines shown in Table II below:

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TABLE II

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              | .                                        |

71. The method of Claim 70 wherein the organic substrate is selected from the group consisting of benzene, toluene, anisole and 2-naphthol.
72. The method of Claim 71 wherein the organic substrate is anisole.
73. The method of Claim 70 wherein the acylating agent is selected from the group consisting of carboxylic acid derivatives, carboxylic acids, acid anhydrides, esters, and acyl halides.
74. A process for the production of light olefins from a feedstock comprising an oxygenate or mixture of oxygenates, the process comprising reacting the feedstock at effective conditions over a catalyst comprising a crystalline molecular sieve having a mole ratio greater than about 15 of (1) an oxide of a first tetravalent element to (2) an oxide of a trivalent element, pentavalent element, second tetravalent element which is different from said first tetravalent element or mixture thereof and having, after calcination, the X-ray diffraction lines shown in Table II below:

TABLE II

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              |                                          |

75. The process of Claim 74 wherein the light olefins are ethylene, propylene, butylene or mixtures thereof.

76. The process of Claim 75 wherein the light olefin is ethylene.

77. The process of Claim 74 wherein the oxygenate is methanol, dimethyl ether or a mixture thereof.

78. The process of Claim 77 wherein the oxygenate is methanol.

79. A process for separating gasses comprising contacting a mixture of gasses with a membrane containing a molecular sieve wherein the molecular sieve comprises a crystalline molecular sieve having a mole ratio greater than about 15 of (1) an oxide of a first tetravalent element to (2) an oxide of a trivalent element, pentavalent element, second tetravalent element which is different from said first tetravalent element or mixture thereof and having, after calcination, the X-ray diffraction lines shown in Table II below:

1

TABLE II

2

Calcined SSZ-742 Theta<sup>(a)</sup>d-spacing (Angstroms)Relative Integrated  
Intensity (%)

|       |       |    |
|-------|-------|----|
| 7.98  | 11.07 | M  |
| 8.70  | 10.16 | VS |
| 8.89  | 9.93  | S  |
| 9.08  | 9.74  | S  |
| 14.02 | 6.31  | W  |
| 14.93 | 5.93  | M  |
| 16.03 | 5.52  | M  |
| 23.26 | 3.82  | VS |
| 23.95 | 3.71  | W  |
| 24.08 | 3.69  | M  |

3

<sup>(a)</sup> ± 0.1

4

5 80. The process of Claim 79 wherein the mixture of gasses comprises  
6 carbon dioxide and methane.

7

8 81. A process for producing methylamine or dimethylamine comprising  
9 reacting methanol, dimethyl ether or a mixture thereof and ammonia in  
10 the gaseous phase in the presence of a catalyst comprising a crystalline  
11 molecular sieve having a mole ratio greater than about 15 of (1) an oxide  
12 of a first tetravalent element to (2) an oxide of a trivalent element,  
13 pentavalent element, second tetravalent element which is different from  
14 said first tetravalent element or mixture thereof and having, after  
15 calcination, the X-ray diffraction lines shown in Table II below:

TABLE II

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              |                                          |

82. The process of Claim 81 wherein the methanol, dimethylether or mixture thereof and ammonia are present in amounts sufficient to provide a carbon/nitrogen ratio from about 0.2 to about 1.5.

83. The process of Claim 81 conducted at a temperature of from about 250°C to about 450°C.

84. A process for treating a cold-start engine exhaust gas stream containing hydrocarbons and other pollutants consisting of flowing said engine exhaust gas stream over a molecular sieve bed which preferentially adsorbs the hydrocarbons over water to provide a first exhaust stream, and flowing the first exhaust gas stream over a catalyst to convert any residual hydrocarbons and other pollutants contained in the first exhaust gas stream to innocuous products and provide a treated exhaust stream and discharging the treated exhaust stream into the atmosphere, the molecular sieve bed comprising a crystalline molecular sieve having a mole ratio greater than about 15 of (1) an oxide of a first tetravalent element to (2) an oxide of a trivalent element, pentavalent element, second tetravalent element which is different from said first tetravalent

1 element or mixture thereof and having, after calcination, the X-ray  
2 diffraction lines shown in Table II below:

3  
4 TABLE II

5 Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| (a) $\pm 0.1$                |                              |                                          |

6  
7  
8 85. The process of Claim 84 wherein the engine is an internal combustion  
9 engine.

10  
11 86. The process of Claim 85 wherein the internal combustion engine is an  
12 automobile engine.

13  
14 87. The process of Claim 84 wherein the engine is fueled by a  
15 hydrocarbonaceous fuel.

16  
17 88. The process of Claim 84 wherein the molecular sieve has deposited on it  
18 a metal selected from the group consisting of platinum, palladium,  
19 rhodium, ruthenium, and mixtures thereof.

20  
21 89. The process of Claim 88 wherein the metal is platinum.

22  
23 90. The process of Claim 88 wherein the metal is palladium.

91. The process of Claim 88 wherein the metal is a mixture of platinum and palladium.

92. A process for the preparation of amides from oximes via Beckmann rearrangement comprising contacting the oxime in the vapor phase with a catalyst comprising a crystalline molecular sieve having a mole ratio greater than about 15 of (1) an oxide of a first tetravalent element to (2) an oxide of a trivalent element, pentavalent element, second tetravalent element which is different from said first tetravalent element or mixture thereof and having, after calcination, the X-ray diffraction lines shown in Table II below:

TABLE II

Calcined SSZ-74

| <u>2 Theta<sup>(a)</sup></u> | <u>d-spacing (Angstroms)</u> | <u>Relative Integrated Intensity (%)</u> |
|------------------------------|------------------------------|------------------------------------------|
| 7.98                         | 11.07                        | M                                        |
| 8.70                         | 10.16                        | VS                                       |
| 8.89                         | 9.93                         | S                                        |
| 9.08                         | 9.74                         | S                                        |
| 14.02                        | 6.31                         | W                                        |
| 14.93                        | 5.93                         | M                                        |
| 16.03                        | 5.52                         | M                                        |
| 23.26                        | 3.82                         | VS                                       |
| 23.95                        | 3.71                         | W                                        |
| 24.08                        | 3.69                         | M                                        |
| <sup>(a)</sup> ± 0.1         |                              | .                                        |

93. The process of Claim 92 wherein the oxime is cyclohexanone oxime and the amide is caprolactam.

94. The process of Claim 93 wherein the rearrangement takes place in the presence of a solvent.

95. The process of Claim 94 wherein the solvent is of the type R<sup>1</sup> - O - R<sup>2</sup> wherein R<sup>1</sup> is a C<sub>1</sub> – C<sub>4</sub> alkyl chain and R<sup>2</sup> can be a hydrogen atom or an

- 1 alkyl chain containing a number of carbon atoms less than or equal to
- 2 R<sup>1</sup>.

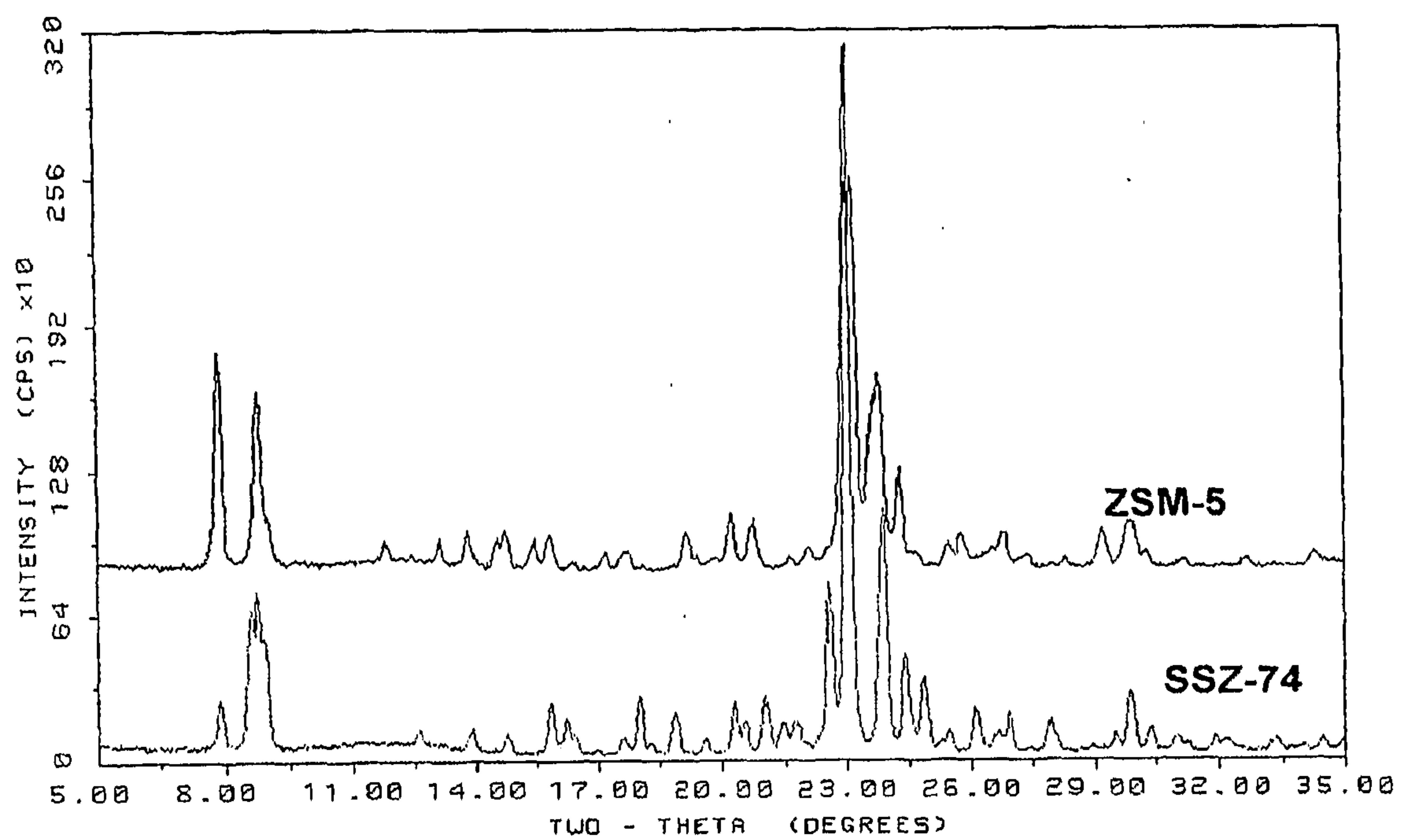


FIG. 1

