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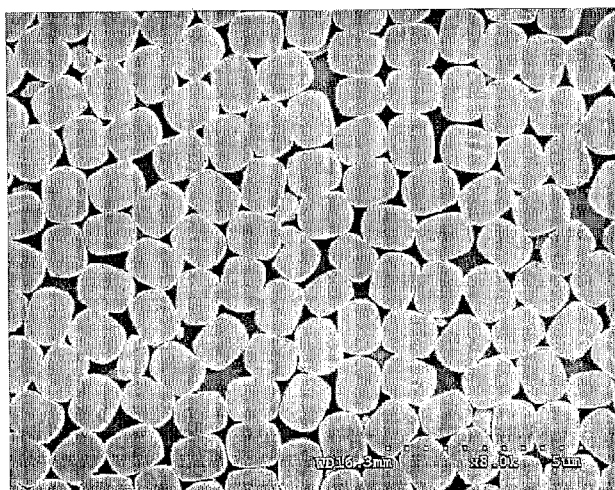
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(54) Title: UNIFORMLY B-ORIENTED MFI ZEOLITE MEMBRANE WITH VARIABLE THICKNESS SUPPORTED ON SUBSTRATE AND PREPARATION METHOD THEREOF

【Figure 2】



(57) Abstract: A b-oriented MFI zeolite membrane with variable thickness is provided. The MFI zeolite membrane is composed of zeolite crystals whose b-axes are all uniformly oriented perpendicular to a substrate. Further provided is a method for preparing the MFI zeolite membrane. The method comprises forming zeolite or zeotype molecular sieve seeds with different thicknesses on a substrate and adding the seeded substrate to a gel for the synthesis of an MFI zeolite containing a structure-directing agent to grow zeolite or zeotype molecular sieve crystals thereon. The MFI zeolite membrane overcomes the limitations of prior art zeolite membranes to maximize its applicability.



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

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A. CLASSIFICATION OF SUBJECT MATTER*C01B 39/36(2006.01)i*

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC C01B 7/08, C01B 39/40, B01J 29/06

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean Utility models and applications for Utility models since 1975.

Japanese Utility models and applications for Utility models since 1975.

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal) & keyword : membrane, MFI zeolite, seed crystal, secondary growth

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 07357836 B2 (MICHAEL TSAPATSIS et al.) 15 April 2008 See the abstract, column 15 line 31 - column 19 line 50 and figures 1-10	1-15
X A	US 06190638 B1 (MARC H. ANTHONIS et al.) 20 February 2001 See the abstract and column 1 line 54 - column 5 line 31	1-5,7-9,12-15 6,10-11
A	US 06689195 B1 (MARC HENRI CAROLINA ANTHONIS et al.) 10 February 2004 See the abstract and column 2 line 25 - column 5 line 29	1-15
A	US 06692640 B2 (MASAHIKO MATSUKATA et al.) 17 February 2004 See the abstract and column 1 lines 20 - 63	1-15

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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04 JANUARY 2010 (04.01.2010)

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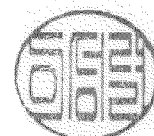
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INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 07357836 B2	15.04.2008	US 2005-014371 A1	20.01.2005
US 06190638 B1	20.02.2001	AU 1370997 A	01.08.1997
		CN 1207085 A	03.02.1999
		CN 1093004 C	23.10.2002
		CN 1208363 A	17.02.1999
		CN 1207085 C0	03.02.1999
		CN 1208363 A0	17.02.1999
		DE 69604830 D1	25.11.1999
		DE 69604830 T2	18.05.2000
		DE 69608128 T2	16.11.2000
		DE 69608128 D1	08.06.2000
		EP 0871586 A1	21.10.1998
		EP 0873176 A1	28.10.1998
		EP 0871586 B1	20.10.1999
		EP 0873176 B1	03.05.2000
		ES 2140151 T3	16.02.2000
		ES 2147658 T3	16.09.2000
		GB 9600082 D0	06.03.1996
		JP 2000-502025 T	22.02.2000
		JP 2000-502948 T	14.03.2000
		JP 2000-502025 A	22.02.2000
		JP 2000-502948 A	14.03.2000
		KR 10-1999-0077002 A	25.10.1999
		KR 10-1999-0077003 A	25.10.1999
		RU 2174044 C2	27.09.2001
		RU 2185228 C2	20.07.2002
		US 06074457 A	13.06.2000
		WO 1997-025129 A1	17.07.1997
		WO 1997-025272 A1	17.07.1997
		ZA 9700057 A	03.07.1998
US 06689195 B1	10.02.2004	AU 3288300 A	28.09.2000
		AU 2000-32883 A1	10.03.2000
		BR 0008877 A	22.01.2002
		CA 2364431 A1	14.09.2000
		CN 1344179 A	10.04.2002
		CN 1344179 A0	10.04.2002
		EP 1163046 A1	19.12.2001
		GB 9905561 D0	05.05.1999
		JP 2002-537990 T	12.11.2002
		JP 2002-537990 A	12.11.2002
		KR 10-2002-0024575 A	30.03.2002
		PA 01009144 A	10.09.2004
		WO 2000-053297 A1	14.09.2000
		ZA 200108336 A	10.01.2003

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2009/002463Patent document
cited in search reportPublication
datePatent family
member(s)Publication
date

US 06692640 B2

17.02.2004

DE 60112147 D1

01.09.2005

DE 60112147 T2

20.04.2006

EP 1129767 A1

05.09.2001

EP 1129767 B1

27.07.2005

JP 2001-240411 A

04.09.2001

US 2001-0012505 A1

09.08.2001