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PRODUCTION OF MOTOR FUEL

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This invention relates to the production of motor fuel, and more particularly to the production of a high quality motor gasoline from certain polymers produced in the treatment of gasoline obtained by the steam cracking of petroleum naphthas.

When a petroleum naphtha having a boiling range, for example, of 100–200° C. A. S. T. M. is cracked in the presence of steam at elevated temperature for the production of ethylene and propylene, a cracked gasoline is also produced. It is usual to subject this cracked gasoline to thermal-polymerization at a low temperature in order to stabilize it against gum formation, and the resulting gasoline boiling below 200° C. is suitable for use as a motor gasoline without further treatment. During this operation, a higher boiling polymer is formed amounting to between 10 and 16% by weight of the cracked gasoline, and the principal object of the present invention is to utilize this polymer or a portion thereof for the formation of a further quantity of gasoline which is of high quality.

It has now been discovered that said polymer or a part thereof may be catalytically hydrogenated at elevated temperature and the hydrogenated product fractionated to yield a gasoline fraction of high quality. It has also been discovered that a fraction rich in aromatics and boiling above the gasoline range may be separated from the hydrogenated product.

According to the invention therefore, said polymer or a part thereof is catalytically hydrogenated at elevated temperature and pressure and the product of the hydrogenation process is fractionated to yield a gasoline fraction.

According to a further feature of the invention, the product of the hydrogenation process is fractionated to yield a gasoline fraction and a higher boiling fraction rich in aromatics.

According to yet another feature of the invention, a lower boiling fraction of said polymer, for example a fraction having a boiling range of 200 to 300° C., may be subjected to the hydrogenation process.

The conditions of the hydrogenation process may vary within the following limits:

Temperature	650–850° F.
Pressure	500–1000 p. s. i. ga.
Space velocity	Up to 10 v./v./hr. of liquid feedstock.
Gas recycle rate	Up to 10,000 S. C. F./B.

The catalyst may be any known hydrogenation catalyst but a catalyst consisting of the oxides of cobalt and molybdenum supported on alumina is preferred.

Methods of carrying the invention into effect will now be described by way of example only.

Example 1

A steam cracker gasoline was subjected to polymerization treatment at a pressure of 375 p. s. i. ga., a temperature of 200° C. and a residence time of 8 hours. The

polymer, which amounted to about 16% wt. on feeds was hydrogenated over a catalyst consisting of the oxides of cobalt and molybdenum on alumina at a pressure of 1000 p. s. i. ga., a temperature of 780° F., a space velocity of liquid polymer of 1.0 v./v./hr. and a gas recycle rate of 4000 S. C. F./B.

The steam cracker gasoline had the following properties before and after polymerization:

	Before Polymerization	After Polymerization and removal of ca. 16% wt. Polymer
Specific Gravity @ 60° F./60° F	0.7865	0.8085
A. S. T. M. Distillation, ° C:		
I. B. P	23	37
2%	28	51
5%	35	60
10%	44	70
20%	63	85
30%	86	97.5
40%	103.5	108.5
50%	123	120
60%	137	131
70%	151.5	141
80%	164.5	152
90%	188	165
F. B. P	199	184
Bromine Number	77.5	45
Octane Number (Motor Method)	82.2	80
Octane Number (Research Method clear)	96.5	94.1

The hydrogenated polymer had the following properties:

Specific Gravity @ 60° F./60° F	0.8835
A. S. T. M. Distillation, ° C.:	
I. B. P	44
2%	61
5%	71.5
10%	85
20%	103
30%	124
40%	148.5
50%	170
60%	191
70%	210
80%	230.5
90%	257
F. B. P	325
Bromine Number	3.3
Aniline Point, ° C	−17
Diesel Index	0.4
Hydrocarbon Type Analysis (A. S. T. M. D. 875):	
Aromatics, percent vol	71
Olefins, percent vol	3
Naphthenes and Paraffins, percent vol	26

The hydrogenated polymer was distilled to yield fractions boiling below and above 200° C., such fractions having the following properties:

	I. B. P., 200° C., Fraction	200° C., F. B. P., Fraction	
Yield, Percent volume	70	30	
Octane Number (Research Method clear)			
(Micro-Analytical Method)	98.1		
	F. I. A. Method	F. I. A. Method	A. S. T. M. D. 875
Hydrocarbon Type Analysis:			
Aromatics	57.5	98.0	90.0
Olefins	1.0	1.0	5.5
Paraffins and Naphthenes	41.5	2.0	4.5

Example 2

The same steam cracker gasoline as in Example 1 was

subjected to polymerization treatment under the same conditions as in Example 1. A distillate fraction of the polymer was then hydrofined under the following conditions:

Pressure, p. s. i. ga	700
Temperature, ° F	780
Space Velocity, v./v./hr	1.0
Gas Recycle Rate, S. C. F./B	4000

The polymer distillate fraction had the following properties before and after hydrofining:

	Feedstock, Distillate Polymer	Hydrogenated, product
Yield on Total Polymer, Percent wt	50	
Yield on Steam Cracker Gasoline, Percent wt	8	
Specific Gravity @ 60° F./60° F	0.9725	0.9010
A. S. T. M. Distillation, ° C.:		
I. B. P.	194	52.5
2%	212	64
5%	217.5	78
10%	220	97.5
20%	222	158
30%	227	192
40%	232	214
50%	237	225
60%	242.5	234
70%	251	244.5
80%	259.5	259.5
90%	273	283.5
F. B. P	277	Cut
Bromine Number	105	2.8
Octane Number (Research Method clear)		97.4
Hydrocarbon Type Analysis, F. I. A. Method:		
Aromatics, Percent vol		71.6
Olefins, Percent vol		1.2
Naphthenes and Paraffins, Percent vol		27.2

I claim:

1. A process for the production of high quality motor gasoline from the high boiling polymer which is formed by thermal polymerization of certain highly unsaturated components of steam cracked gasoline in subjecting steam cracked gasoline to a low temperature thermal polymerization treatment to stabilize it against gum formation, and which polymer is removed from the treated gasoline as a waste product amounting to between about 10% and 16% by weight of the steam cracked gasoline, which process comprises catalytically hydrogenating at least part of said polymer at a temperature in the range of from about 650° F. to 850° F., a pressure in the range of from about 500 p. s. i. g. to about 1000 p. s. i. g., a space velocity not in excess of about 10 v./v./hr. of liquid feedstock, and a gas recycle rate not in excess of about 10,000 S. C. F./B., and fractionating the resulting hydrogenated product to yield said high quality motor gasoline.

2. A process according to claim 1, wherein the product of the hydrogenation process is fractionated to yield in addition a higher boiling fraction rich in aromatics.

3. A process according to claim 1, wherein a lower boiling fraction of the polymer is subjected to the hydrogenation process.

4. A process according to claim 3, wherein said lower boiling fraction has a boiling range of 200 to 300° C.

5. A process according to claim 1, wherein the hydrogenation catalyst consists of the oxides of cobalt and molybdenum supported on alumina.

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