additionally added.

In this process, benzene and toluene are produced, and these compounds (11) are recirculated into a transalkylation step. In the transalkylation step, the recirculated benzene and toluene can be converted into xylene. Consequently, all fractions discharged from the xylene isomerization step are recirculated into the transalkylation step, and thus para-xylene can be additionally obtained.

That is, when the para-xylene separation step and the xylene isomerization step were not added, only mixed xylene was produced. However, when these steps are added, meta-xylene and ortho-xylene are not produced, and only high value-added para-xylene can be obtained.

Mode for Invention

Hereinafter, the present invention will be described in more detail with reference to the following Examples. ~~However, these Examples are set forth to illustrate the present invention, and the scope of the present invention is not limited thereto.~~

Example 1

As the light cycle oil used in the method of present invention, as shown in Table 1 below, light cycle oil, which is an oil fraction produced by a fluidized catalytic cracking

1-ring aromatics	39.024	71.331	28.561
1-ring aromatics not having naphthenic ring	26.951	27.281	25.404
BTX + C9	9.431	5.904	18.428
B + X	1.473	0.723	6.941
T + C9	7.958	5.180	11.487
B	0.024	-	0.686
T	0.344	0.097	3.557
X	1.449	0.723	6.255
C9	7.614	5.084	7.930
1-ring aromatics having one naphthenic ring	12.072	39.892	3.157
1-ring aromatics having two naphthenic rings	-	4.157	-
2-ring aromatics	40.975	8.027	25.123
2-ring aromatics not having naphthenic ring	38.398	4.295	23.590
2-ring aromatics having one naphthenic ring	2.577	3.599	1.533
2-ring aromatics having two naphthenic rings	-	0.134	-
3-ring aromatics	4.123	0.662	2.977
Others	10.697	13.630	1.890

As shown in Table 4 above, it can be ascertained that the amount of benzene/xylene, which are high value-added aromatic components, was increased by ~~59.9%~~ 371.2% *(=6.941/1.473)* compared to that of the initial feed. Further, it can be ascertained that the amount of toluene and C9, which would be converted into raw materials of benzene/xylene by transalkylation, is increased by about ~~121.7%~~ 44.3% *(=11.487/1.958)* compared to that of the initial feed.

Comparing the feed (that is, the feed after the hydroprocessing) before and after the fluidized catalytic cracking reaction, it can be ascertained that the amount of benzene/xylene, which are high value-added aromatic

components, was increased by ~~95.4%~~ 859.9% *(=6.941/0.723)*. Further, it can be ascertained that the amount of toluene and C9, which would be converted into raw materials of benzene/xylene by transalkylation, was increased by about ~~371.2%~~ 121.7% *(=11.487/5.180)*.

Here, additionally, light olefins, which were not contained in the introduced feed, were produced. Specifically, ethylene was produced in an amount of 1.766, propylene was 4.119, and butylene was 2.124.

Among the components produced by the fluidized catalytic cracking reaction, the light olefins are recovered, and other components are introduced into a transalkylation step.

The results of comparing the yields before and after transalkylation are shown in Table 5 below.

[Table 5]

	Feed	Hydroprocessing	Fluidized catalytic cracking	Transalkylation
H_2 consumption		1.186	-	0.224
Coke		-	11.027	11.027
H_2S		0.417	0.420	0.420
H_2		-	0.065	0.065
Paraffin + Olefin	4.680	5.376	24.745	27.575
Ethylene	-	-	1.766	1.766
Propylene	-	-	4.119	4.119
Butylene	-	-	2.124	2.124
Naphthene	0.502	1.744	0.493	0.179
Total amount of aromatics	84.121	80.020	56.661	54.360
1-ring aromatics	39.024	71.331	28.561	26.260
1-ring aromatics not having naphthenic ring	26.951	27.281	25.404	24.031
BTX + C9	9.431	5.904	18.428	20.070
B + X	1.473	0.723	6.941	20.070

in Example 3, the amount of ethylene was increased by 61.5%, the amount of propylene was increased by ~~57.3%~~ 66.1% *(=6.840/4.119)* and the amount of butylene was increased by 20.3%, compared to those of Example 1. Further, it can be ascertained that, in Example 3, the amounts of benzene and xylene, which are high value-added aromatic components, were greatly increased by about ~~159%~~ 59% *(=4.217/2.649)* and about ~~150%~~ 50% *(=26.148/17.421)*, respectively.

Comparative Example 1

In Comparative Example 1, the same feed as in Example 1 was used, and this feed was passed through a hydroprocessing step, a fluidized catalytic cracking step and a separation step.

Here, the conditions applied to each of the steps were the same as those of Example 1.

Comparative Example 2

Comparative Example 2 was carried out in the same manner as in Comparative Example 1, except that, in the separation step, i) aromatic components of 2 rings or more, ii) 1-ring aromatics that cannot be converted into raw materials of high value-added aromatic products because they have a hydrocarbon group of two or more carbon atoms, iii) 1-ring aromatics that are not high value-added aromatic products and cannot be converted into raw materials of high value-added aromatic

2-ring aromatics	4.123	25.123	-	-	25.234	-
2-ring aromatics not having naphthenic ring	10.697	23.590	-	-	23.695	-
2-ring aromatics having one naphthenic ring		1.533	-	-	1.539	-
2-ring aromatics having two naphthenic rings		-	-	-	-	-
3-ring aromatics		2.977	-	-	2.991	-
Others		1.890	-	-	1.898	-

As shown in Table 8 above, it can be ascertained that the yields of benzene and xylene of Examples 1 to 3 in each which light cycle oil was treated according to the present invention were greatly increased compared to those of Comparative Examples 1 and 2.

Particularly, it can be ascertained that, in the case of Example 3 including the two recirculation steps, aromatic components of 2 rings or more scarcely existed, and that the yields of high value-added olefins and high value-added aromatics of Example 3 were greatly high compared to those of Comparative Examples 1 and 2.

~~Although the embodiments of the present invention have been disclosed for illustrative purposes, it will be appreciated that the present invention is not limited thereto, and those skilled in the art will appreciate that various modifications, additions and substitutions are possible,~~

~~without departing from the scope and spirit of the invention.~~

Accordingly, any and all modifications, variations or equivalent arrangements should be considered to be within the scope of the invention, and the detailed scope of the invention will be disclosed by the accompanying claims.

CLAIMS

1. A method of producing aromatic products and olefinic products from an aromatic compound-containing oil fraction, comprising the steps of:

(a) hydroprocessing an aromatic compound-containing oil fraction in the presence of a catalyst to partially saturate components in the oil fraction;

(b) catalytic cracking the components partially saturated in step (a) in the presence of a cracking catalyst which is a spherical catalyst comprising an amorphous solid acid including silica and alumina or comprising a crystalline zeolite molecular sieve having a silica/alumina molar ratio of 300 or less and a pore size of 4 ~ 10 Å (Angstrom);

(c) separating the components cracked in step (b) into (i) benzene, toluene, xylene and aromatic components of 9 or more carbon atoms, (ii) olefin components and (iii) a residual oil fraction; and

(d) carrying out transalkylation of benzene, toluene and aromatic components of 9 or more carbon atoms separated in step (c).

2. The method of claim 1, wherein, in step (a), the catalyst includes at least one carrier selected from among alumina and silica, and includes at least one metal selected from among group 6 metals, group 9 metals and group 10 metals.

3. The method of claim 2, wherein the metal is at least one selected from among cobalt, molybdenum, nickel and tungsten.

4. The method of claim 1, wherein the aromatic compound-containing oil fraction includes 5 wt% or more of aromatics.

5. The method of claim 1, wherein the aromatic compound-containing oil fraction is any one selected from among raw pyrolysis gasoline (RPG), heavy raw pyrolysis gasoline (heavy RPG), treated pyrolysis gasoline (TPG), reformate, heavy aromatics, kerosine, jet oil, atmospheric gas oil, FCC gasoline, light cracked naphtha, heavy cracked naphtha, FCC decanted oil, vacuum gas oil, coker gas oil, coker diesel, coker naphtha, heavy and reduced petroleum crude oil, petroleum atmospheric distillation bottom oil, petroleum vacuum distillation bottom oil, pitch, asphalt, bitumen, tar sand oil, shale oil, liquid products derived from coal liquefaction processes, heavy hydrocarbon residues), and combinations thereof.

6. ~~The method of claim 1, wherein, in step (b), the catalyst for catalytic cracking is a spherical catalyst comprising an amorphous solid acid including silica and~~

~~alumina or comprising a crystalline zeolite molecular sieve having a silica/alumina molar ratio of 300 or less and a pore size of 4 ~ 10 Å (Angstrom)~~

~~7~~6. The method of claim ~~6~~1, wherein the catalyst for catalytic cracking is prepared by mixing 10 ~ 95 wt% of at least one zeolite molecular sieve selected from the group consisting of faujasite (FAU), mordenite (MOR) and zeolite beta (BEA) with 5 ~ 90 wt% of an inorganic binder selected from among alumina and clay and then spray drying the mixture to have a particle size of 10 ~ 300 μm.

~~8~~7. The method of claim 1, wherein, in step (c), the residual oil fraction includes i) aromatic components of 2 rings or more, ii) 1-ring aromatic components having a hydrocarbon group of two or more carbons, and iii) 1-ring aromatic components having a naphthenic ring.

~~9~~8. The method of claim 1, further comprising the step of recirculating the residual oil fraction separated in step (c) to step (a).

~~10~~9. The method of claim 1 or ~~9~~8, further comprising the step of separating naphthalenes from the residual oil fraction.

110. The method of claim 1, further comprising the step of recirculating the residual oil fraction separated in step (c) to step (b).

121. The method of any one of claims 1, 98 and 110, further comprising the step of recirculating the aromatic components of 11 or more carbon atoms produced in step (d) to step (b).

132. The method of any one of claims 1, 98 and 110, further comprising the step of separating ethylene, propylene and butylene from the olefine components and then refining and productizing each of them.

143. The method of any one of claims 1, 98 and 110, further comprising the step of separating para-xylene from mixed xylene produced by the transalkylation, after the step of transalkylation.

154. The method of claim 143, further comprising the step of separating para-xylene from mixed xylene produced by the transalkylation, after the step of transalkylation.

165. The method of claim 143, further comprising the

steps of: isomerizing the mixed xylene having passed through the step of separating the para-xylene; and recirculating the isomerized mixed xylene to the step of transalkylation.

176. The method of claim 154, further comprising the steps of: isomerizing the mixed xylene having passed through the step of separating the para-xylene; and recirculating the isomerized mixed xylene to the step of transalkylation.

187. The method of claim 1, wherein the aromatic products and olefinic products include ethylene, propylene, butylene, naphthalenes, benzene and xylene.