

Amended Claims

1. A catalytic cracking catalyst, which comprises a cracking active component, 10wt%-70wt% of a clay on the dry basis, and 10wt%-40wt% of an inorganic oxide binder (as oxide), relative to the weight of the catalytic cracking catalyst,
wherein said cracking active component contains, relative to the weight of the catalytic cracking catalyst, 10wt%-50wt% of a modified Y-type zeolite on the dry basis and 0-40wt% of other zeolite on the dry basis,

wherein said modified Y-type zeolite is characterized by having
a unit cell size of 2.420-2.440nm;

as percent by weight of the modified Y-type zeolite, a phosphorus content of 0.05-6%, a RE_2O_3 content of 0.03-10%, and an alumina content of less than 22%; and
a specific hydroxy nest concentration of less than 0.35mmol/g, preferably less than 0.35mmol/g and not less than 0.14mmol/g,

said specific hydroxy nest concentration =
$$\frac{[(M_{500^\circ\text{C}} - M_{200^\circ\text{C}}) - (17/9) \times (M_{800^\circ\text{C}} - M_{500^\circ\text{C}})] \times 1000}{36 \times (1 - M_{200^\circ\text{C}}) \times C} \quad (\text{Unit: mmol/g})$$

wherein $M_{200^\circ\text{C}}$, $M_{500^\circ\text{C}}$ and $M_{800^\circ\text{C}}$ respectively represent the weight loss percents of a sample measured at 200°C, 500°C and 800°C, and C is the crystallinity of the sample.

2. The catalytic cracking catalyst according to claim 1, wherein said unit cell size is 2.428-2.438nm; as percent by weight of the modified Y-type zeolite, the phosphorus content is 0.1-4.5%, the RE_2O_3 content is 0.1-4.5%, the alumina content is less than 21%; the specific hydroxy nest concentration is less than 0.3mmol/g and not less than 0.14mmol/g.

3. The catalytic cracking catalyst according to claim 1, wherein said clay is selected from the group consisting of kaolin, metahalloysite, montmorillonite, diatomite, halloysite, saponite, rectorite, sepiolite, attapulgite, hydrotalcite, bentonite and any mixture thereof;
wherein said inorganic oxide binder is an alumina binder, including γ -alumina, η -alumina, θ -alumina, χ -alumina, pseudoboehmite, boehmite, gibbsite, bayerite, and any mixture thereof.

4. The catalytic cracking catalyst according to claim 1, wherein said other zeolite is selected

from one or more of the following:

Y-type zeolite such as one or more zeolites of REY, REHY, DASY, USY, and REUSY;

MFI-structured zeolite such as one or more zeolites of ZSM-5, ZRP, and ZSP;

Beta zeolite; and

non-zeolite molecular sieve such as SAPO and a titanium silicate molecular sieve.

5. The catalytic cracking catalyst according to claim 1, wherein, relative to the weight of the catalytic cracking catalyst, said catalytic cracking catalyst comprises:

10wt%-70wt% of the clay on the dry basis;

10wt%-40wt% of the inorganic oxide binder (as oxide); and

the cracking active component

wherein said cracking active component comprises, substantially consists of or consists of:

(A) 10wt%-50wt% of the modified Y-type zeolite on the dry basis;

(B) optionally, one or more of the following:

(1) not more than 30wt% of MFI-structured zeolite on the dry basis;

(2) not more than 30wt% of Mg-containing ultra stable Y-type zeolite on the dry basis;

(3) on the dry basis, not more than 30wt% of rare earth modified, gas-phase ultra stable Y-type zeolite and/or rare earth-containing, acid-treated, hydrothermally dealuminated Y-type zeolite; and

(C) optionally,

(4) on the dry basis, not more than 30wt% of Y-type zeolite selected from the group consisting of REY, REHY, DASY, USY, REUSY and any mixture thereof,

wherein, the total weight of the above (1), (2), (3) and (4) is not more than 40wt%.

6. The catalytic cracking catalyst according to claim 1, wherein said modified Y-type zeolite is prepared by the following process, wherein the modified Y-type zeolite is obtained by using a NaY zeolite as starting material and through three exchange steps in which a rare earth-containing substance and a phosphorus-containing substance are used and three hydrothermally treating steps,

wherein, the introduction of phosphorus and rare earth is done by the exchange step;

wherein independently in each exchange step, the zeolite is added to a

phosphorus-containing exchanging solution or a rare earth-containing exchanging solution;
wherein phosphorus is introduced at any exchange step; and
wherein rare earth is introduced at any exchange step except the first exchange step.

7. The catalytic cracking catalyst according to claim 6, said process further comprises: a dealumination agent is introduced at any exchange step except the first exchange step.

8. The catalytic cracking catalyst according to claim 6, wherein said phosphorus-containing substance is selected from the group consisting of orthophosphoric acid, phosphorous acid, pyrophosphoric acid, ammonium phosphate, diammonium hydrogen phosphate, ammonium dihydrogen phosphate, aluminum phosphate, and any mixture thereof.

9. The catalytic cracking catalyst according to claim 6, wherein said rare earth-containing substance is selected from the group consisting of lanthanum oxide, cerium oxide, lanthanum nitrate, cerium nitrate, lanthanum chloride, cerium chloride, a mixed rare earth nitrate, a mixed rare earth chloride, and any mixture thereof.

10. The catalytic cracking catalyst according to claim 7, wherein said dealumination agent is selected from the group consisting of ethylene diamine tetraacetic acid, oxalic acid, citric acid, sulfosalicylic acid, fluorosilicic acid, hydrochloric acid, sulphuric acid, nitric acid, ammonium oxalate, ammonium fluoride, ammonium fluorosilicate, ammonium fluoroborate, and any mixture thereof.

11. The catalytic cracking catalyst according to claim 6, which further comprises: the exchange is conducted at 60-100°C, e.g. 70-90°C for at least 0.5 hour, e.g. 1-2 hours.

12. The catalytic cracking catalyst according to claim 6, wherein each of the hydrothermally treating steps is independently conducted at 350-650°C, e.g. 550-600°C, in a condition of 1-100%, e.g. 70%-100% steam for at least 0.5 hour, e.g. 1-2 hours.

13. The catalytic cracking catalyst according to claim 6, which is characterized in that said

process comprises the following steps:

- 1) a NaY zeolite is mixed with an ammonium salt, an ammonium phosphate salt and water in a ratio of the NaY zeolite: the ammonium salt: the ammonium phosphate salt: water=1:[0.4-1]:[0-0.04]:[5-10] to obtain a slurry, the slurry is adjusted with an inorganic acid to a pH of 3.0-4.5, then the slurry is treated at 70-95°C for at least 0.5 hour, and then washed, wherein, the NaY zeolite is on the dry basis, the ammonium phosphate salt is based on the elemental phosphorus;
- 2) the product obtained in the step 1) is calcined at 350-650°C in a condition of 1-100% steam for at least 0.5 hour to obtain a firstly calcined zeolite;
- 3) the firstly calcined zeolite obtained in the step 2), phosphoric acid, an dealumination agent and water are mixed in a ratio of the firstly calcined zeolite: phosphoric acid: the dealumination agent: water=1:[0-0.04]:[0.02-0.3]:[5-10], the resulting mixture is adjusted with an inorganic acid to a pH of 2.3-3.5, then treated at 50-90°C for at least 0.5 hour, filtered and washed (washing temperature $\geq$ 50°C), wherein, the firstly calcined zeolite is on the dry basis, and phosphoric acid is based on the elemental phosphorus;
- 4) the product obtained in the step 3) is calcined at 350-650°C in a condition of 1-100% steam for at least 0.5 hour to obtain a secondly calcined zeolite;
- 5) the secondly calcined zeolite obtained in the step 4) is mixed with a (mixed) rare earth chloride and water in a ratio of the secondly calcined zeolite: the rare earth chloride: water=1:[0.01-0.05]:[5-10], the resulting mixture is then treated at 70-90°C for at least 0.5 hour, filtered and washed (washing temperature $\geq$ 50°C), wherein, the secondly calcined zeolite is on the dry basis, and the rare earth chloride is based on RE₂O₃;
- 6) the product obtained in the step 5) is calcined at 350-650°C, in a condition of 1-100% steam for at least 0.5 hour to obtain a modified Y-type zeolite.

14. A process for preparing a catalytic cracking catalyst, which process comprises: preparing a slurry containing an cracking active component, a clay and a binder; and spray-drying the prepared slurry,

wherein said cracking active component contains a modified Y-type zeolite and other zeolite,

wherein per 100 weight parts of the catalytic cracking catalyst, using 10-70 weight parts of the clay on the dry basis, 10-40 weight parts of the inorganic oxide binder (as oxide), 10-50

weight parts of the modified Y-type zeolite on the dry basis, and 0-40 weight parts of other zeolite on the dry basis to prepare said slurry,

wherein said modified Y-type zeolite is characterized by having a unit cell size of 2.420-2.440nm; as percent by weight of the modified Y-type zeolite, a phosphorus content of 0.05-6%, a RE_2O_3 content of 0.03-10%, and an alumina content of less than 22%; and a specific hydroxy nest concentration of less than 0.35mmol/g, preferably less than 0.35mmol/g and not less than 0.14mmol/g,

said specific hydroxy nest concentration =
$$\frac{[(M_{500^\circ\text{C}} - M_{200^\circ\text{C}}) - (17/9) \times (M_{800^\circ\text{C}} - M_{500^\circ\text{C}})] \times 1000}{36 \times (1 - M_{200^\circ\text{C}}) \times C} \quad (\text{Unit: mmol/g})$$

wherein $M_{200^\circ\text{C}}$, $M_{500^\circ\text{C}}$ and $M_{800^\circ\text{C}}$ respectively represent the weight loss percents of a sample measured at 200°C, 500°C and 800°C, and C is the crystallinity of the sample.

15. The process for preparing the catalytic cracking catalyst according to claim 14, wherein said unit cell size is 2.428-2.438nm; as percent by weight of the modified Y-type zeolite, the phosphorus content is 0.1-4.5%, the RE_2O_3 content is 0.1-4.5%, the alumina content is less than 21%; and the specific hydroxy nest concentration is less than 0.3mmol/g and not less than 0.14mmol/g.

16. The process for preparing the catalytic cracking catalyst according to claim 14, wherein said clay is selected from the group consisting of kaolin, metahalloysite, montmorillonite, diatomite, halloysite, saponite, rectorite, sepiolite, attapulgite, hydrotalcite, bentonite and any mixture thereof; wherein said inorganic oxide binder is an alumina binder, including γ -alumina, η -alumina, θ -alumina, χ -alumina, pseudoboehmite, boehmite, gibbsite, bayerite, and any mixture thereof.

17. The process for preparing the catalytic cracking catalyst according to claim 14, wherein said other zeolite is selected from one or more of the following:

Y-type zeolite such as one or more zeolites of REY, REHY, DASy, USY, and REUSY;

MFI-structured zeolite such as one or more zeolites of ZSM-5, ZRP, and ZSP;

Beta zeolite; and

non-zeolite molecular sieve such as SAPO and a titanium silicate molecular sieve.

18. The process for preparing the catalytic cracking catalyst according to claim 14, wherein per 100 weight parts of the catalytic cracking catalyst, using

10-70 weight parts of the clay on the dry basis;

10-40 weight parts of the inorganic oxide binder (as oxide); and

the cracking active component

wherein said cracking active component comprises, substantially consists of or consists of:

(A) 10-50 weight parts of the modified Y-type zeolite on the dry basis;

(B) optionally, one or more of the following:

(1) not more than 30 weight parts of MFI-structured zeolite on the dry basis;

(2) not more than 30 weight parts of Mg-containing ultra stable Y-type zeolite on the dry basis;

(3) on the dry basis, not more than 30 weight parts of rare earth modified, gas-phase ultra stable Y-type zeolite and/or rare earth-containing, acid-treated, hydrothermally dealuminated Y-type zeolite; and

(C) optionally,

(4) on the dry basis, not more than 30 weight parts of Y-type zeolite selected from the group consisting of REY, REHY, DAS, USY, REUSY and any mixture thereof,

wherein, the total weight of the above (1), (2), (3) and (4) is not more than 40 weight parts.

19. The process for preparing the catalytic cracking catalyst according to claim 14, wherein said modified Y-type zeolite is prepared according to the process as defined in claim 6.

Claims

1. A catalytic cracking catalyst, which comprises a cracking active component, 10wt%-70wt% of a clay on the dry basis, and 10wt%-40wt% of an inorganic oxide binder (as oxide), relative to the weight of the catalytic cracking catalyst,

wherein said cracking active component contains, relative to the weight of the catalytic cracking catalyst, 10wt%-50wt% of a modified Y-type zeolite on the dry basis and 0-40wt% of other zeolite on the dry basis,

wherein said modified Y-type zeolite is characterized by having a unit cell size of 2.420-2.440nm;

as percent by weight of the modified Y-type zeolite, a phosphorus content of 0.05-6%, a RE_2O_3 content of 0.03-10%, and an alumina content of less than 22%; and

a specific hydroxy nest concentration of less than 0.35mmol/g and more than 0.05mmol/g,

$$\text{said specific hydroxy nest concentration} = \frac{[(M_{500^\circ\text{C}} - M_{200^\circ\text{C}}) - (17/9) \times (M_{800^\circ\text{C}} - M_{500^\circ\text{C}})] \times 1000}{36 \times (1 - M_{200^\circ\text{C}}) \times C} \quad (\text{Unit: mmol/g})$$

wherein $M_{200^\circ\text{C}}$, $M_{500^\circ\text{C}}$ and $M_{800^\circ\text{C}}$ respectively represent the weight loss percents of a sample measured at 200°C, 500°C and 800°C, and C is the crystallinity of the sample;

wherein said other zeolite is selected from one or more of the following:

Y-type zeolite selected from REY, REHY, DASY, USY, and REUSY;

Mg-containing ultra stable Y-type zeolite;

rare-earth modified, gas-phase ultra stable Y-type zeolite and rare earth-

containing, acid-treated, hydrothermally dealuminated Y-type zeolite;

MFI-structured zeolite selected from ZSM-5, ZRP, and ZSP; Beta zeolite; and

non-zeolite molecular sieve selected from SAPO and a titanium silicate

molecular sieve.

2. The catalytic cracking catalyst according to claim 1, wherein said unit cell size is 2.428-2.438nm; as percent by weight of the modified Y-type zeolite, the phosphorus content is 0.1-4.5%, the RE_2O_3 content is 0.1-4.5%, the alumina content is less than 21%; the specific hydroxy nest concentration is less than 0.3mmol/g and more than 0.10mmol/g.

3. The catalytic cracking catalyst according to claim 1, wherein said clay is selected from the group consisting of kaolin, metahalloysite, montmorillonite, diatomite, halloysite, saponite, rectorite, sepiolite, attapulgite, hydrotalcite, bentonite and any mixture thereof; wherein said inorganic oxide binder is an alumina binder.

4. The catalytic cracking catalyst according to claim 1, wherein said other zeolite is selected from one or more of the following:
Y-type zeolite selected from REY, REHY, DASY, USY, and REUSY;
MFI-structured zeolite selected from ZSM-5, ZRP, and ZSP;
Beta zeolite; and
non-zeolite molecular sieve selected from SAPO and a titanium silicate molecular sieve.

5. The catalytic cracking catalyst according to claim 1, wherein, relative to the weight of the catalytic cracking catalyst, said catalytic cracking catalyst comprises:

10wt%-70wt% of the clay on the dry basis;

10wt%-40wt% of the inorganic oxide binder (as oxide); and

the cracking active component

wherein said cracking active component comprises:

(A) 10wt%-50wt% of the modified Y-type zeolite on the dry basis;

(B) optionally, one or more of the following:

(1) not more than 30wt% of MFI-structured zeolite on the dry basis;

(2) not more than 30wt% of Mg-containing ultra stable Y-type zeolite on the dry basis;

(3) on the dry basis, not more than 30wt% of rare earth modified, gas-phase ultra stable Y-type zeolite and/or rare earth-containing, acid-treated, hydrothermally dealuminated Y-type zeolite; and

(C) optionally,

(4) on the dry basis, not more than 30wt% of Y-type zeolite selected

from the group consisting of REY, REHY, DASY, USY, REUSY and any mixture thereof,

wherein, the total weight of the above (1), (2), (3) and (4) is not more than 40wt%.

6. The catalytic cracking catalyst according to claim 1, wherein said modified Y-type zeolite is prepared by the following process, wherein the modified Y-type zeolite is obtained by using a NaY zeolite as starting material and through three exchange steps in which a rare earth-containing substance and a phosphorus-containing substance are used and three hydrothermally treating steps, wherein, the introduction of phosphorus and rare earth is done by the exchange step; wherein independently in each exchange step, the zeolite is added to a phosphorus-containing exchanging solution or a rare earth-containing exchanging solution; wherein phosphorus is introduced at any exchange step; and wherein rare earth is introduced at any exchange step except the first exchange step.

7. The catalytic cracking catalyst according to claim 6, said process further comprises: a dealumination agent is introduced at any exchange step except the first exchange step.

8. The catalytic cracking catalyst according to claim 6, wherein said phosphorus-containing substance is selected from the group consisting of orthophosphoric acid, phosphorous acid, pyrophosphoric acid, ammonium phosphate, diammonium hydrogen phosphate, ammonium dihydrogen phosphate, aluminum phosphate, and any mixture thereof.

9. The catalytic cracking catalyst according to claim 6, wherein said rare earth-containing substance is selected from the group consisting of lanthanum oxide, cerium oxide, lanthanum nitrate, cerium nitrate, lanthanum chloride, cerium chloride, a mixed rare earth nitrate, a mixed rare earth chloride, and any mixture thereof.

10. The catalytic cracking catalyst according to claim 7, wherein said dealumination agent is selected from the group consisting of ethylene diamine tetraacetic acid, oxalic acid, citric acid, sulfosalicylic acid, fluorosilicic acid, hydrochloric acid, sulphuric acid, nitric acid, ammonium oxalate, ammonium fluoride, ammonium fluorosilicate, ammonium fluoroborate, and any mixture thereof.

11. The catalytic cracking catalyst according to claim 6, which further comprises: each of the exchange steps is conducted at 60-100°C for at least 0.5 hour.

12. The catalytic cracking catalyst according to claim 6, wherein each of the hydrothermally treating steps is independently conducted at 350-650°C in a condition of 1-100% steam for at least 0.5 hour.

13. The catalytic cracking catalyst according to claim 6, which is characterized in that said process comprises the following steps:

- 1) a NaY zeolite is mixed with an ammonium salt, an ammonium phosphate salt and water in a ratio of the NaY zeolite: the ammonium salt: the ammonium phosphate salt: water=1:[0.4-1]:[0-0.04]:[5-10] to obtain a slurry, the slurry is adjusted with an inorganic acid to a pH of 3.0-4.5, then the slurry is treated at 70-95°C for at least 0.5 hour, and then washed, wherein, the NaY zeolite is on the dry basis, the ammonium phosphate salt is based on the elemental phosphorus;
- 2) the product obtained in the step 1) is calcined at 350-650°C in a condition of 1-100% steam for at least 0.5 hour to obtain a firstly calcined zeolite;

- 3) the firstly calcined zeolite obtained in the step 2), phosphoric acid, an dealumination agent and water are mixed in a ratio of the firstly calcined zeolite: phosphoric acid: the dealumination agent: water=1:[0-0.04]:[0.02-0.3]:[5-10], the resulting mixture is adjusted with an inorganic acid to a pH of 2.3-3.5, then treated at 50-90°C for at least 0.5 hour, filtered and washed (washing temperature $\geq$ 50°C), wherein, the firstly calcined zeolite is on the dry basis, and phosphoric acid is based on the elemental phosphorus;
- 4) the product obtained in the step 3) is calcined at 350-650°C in a condition of 1-100% steam for at least 0.5 hour to obtain a secondly calcined zeolite;
- 5) the secondly calcined zeolite obtained in the step 4) is mixed with a (mixed) rare earth chloride and water in a ratio of the secondly calcined zeolite: the rare earth chloride: water=1:[0.01-0.05]:[5-10], the resulting mixture is then treated at 70-90°C for at least 0.5 hour, filtered and washed (washing temperature $\geq$ 50°C), wherein, the secondly calcined zeolite is on the dry basis, and the rare earth chloride is based on RE_2O_3 ;
- 6) the product obtained in the step 5) is calcined at 350-650°C, in a condition of 1-100% steam for at least 0.5 hour to obtain a modified Y-type zeolite.

14. A process for preparing a catalytic cracking catalyst, which process comprises: preparing a slurry containing an cracking active component, a clay and a binder; and spray-drying the prepared slurry, wherein said cracking active component contains a modified Y-type zeolite and other zeolite,

wherein per 100 weight parts of the catalytic cracking catalyst, using 10-70 weight parts of the clay on the dry basis, 10-40 weight parts of the inorganic oxide binder (as oxide), 10-50 weight parts of the modified Y-type zeolite on the dry basis, and 0-40 weight parts of other zeolite on the dry basis to prepare said slurry, wherein said modified Y-type zeolite is characterized by having a unit cell size of 2.420-2.440nm; as percent by weight of the modified Y-type zeolite, a phosphorus content of 0.05-6%, a RE_2O_3 content of 0.03-10%, and an alumina content of less than 22%; and a specific hydroxy nest concentration of less than 0.35mmol/g and more than 0.05mmol/g,

$$\text{said specific hydroxy nest concentration} = \frac{[(M_{500^\circ C} - M_{200^\circ C}) - (17/9) \times (M_{800^\circ C} - M_{500^\circ C})] \times 1000}{36 \times (1 - M_{200^\circ C}) \times C} \quad (\text{Unit: mmol/g})$$

wherein $M_{200^\circ C}$, $M_{500^\circ C}$ and $M_{800^\circ C}$ respectively represent the weight loss percents of a sample measured at 200°C, 500°C and 800°C, and C is the crystallinity of the sample;

wherein said other zeolite is selected from one or more of the following:
Y-type zeolite selected from REY, REHY, DASY, USY, and REUSY;
Mg-containing ultra stable Y-type zeolite;
rare-earth modified, gas-phase ultra stable Y-type zeolite and rare earth-containing, acid-treated, hydrothermally dealuminated Y-type zeolite;
MFI-structured zeolite selected from ZSM-5, ZRP, and ZSP; Beta zeolite; and
non-zeolite molecular sieve selected from SAPO and a titanium silicate molecular sieve.

15. The process for preparing the catalytic cracking catalyst according to claim 14, wherein said unit cell size is 2.428-2.438nm; as percent by weight of the modified Y-type zeolite, the phosphorus content is 0.1-4.5%, the RE_2O_3 content is 0.1-4.5%, the alumina content is less than 21%; and the specific hydroxyl concentration is less than 0.3mmol/g and more than 0.10mmol/g.

16. The process for preparing the catalytic cracking catalyst according to claim 14, wherein said clay is selected from the group consisting of kaolin, metahalloysite, montmorillonite, diatomite, halloysite, saponite, rectorite, sepiolite, attapulgite, hydrotalcite, bentonite and any mixture thereof; wherein said inorganic oxide binder is an alumina binder.

17. The process for preparing the catalytic cracking catalyst according to claim 14, wherein said other zeolite is selected from

one or more of the following:

Y-type zeolite selected from REY, REHY, DASY, USY, and REUSY;

MFI-structured zeolite selected from ZSM-5, ZRP, and ZSP;

Beta zeolite; and

non-zeolite molecular sieve selected from SAPO and a titanium silicate molecular sieve.

18. The process for preparing the catalytic cracking catalyst according to claim 14, wherein per 100 weight parts of the catalytic cracking catalyst, using

10-70 weight parts of the clay on the dry basis;

10-40 weight parts of the inorganic oxide binder (as oxide); and

the cracking active component

wherein said cracking active component comprises:

(A) 10-50 weight parts of the modified Y-type zeolite on the dry basis;

(B) optionally, one or more of the following:

(1) not more than 30 weight parts of MFI-structured zeolite on the dry basis;

(2) not more than 30 weight parts of Mg-containing ultra stable Y-type zeolite on the dry basis;

(3) on the dry basis, not more than 30 weight parts of rare earth modified, gas-phase ultra stable Y-type zeolite and/or rare earth-containing, acid-treated, hydrothermally dealuminated Y-type zeolite; and

(C) optionally,

(4) on the dry basis, not more than 30 weight parts of Y-type zeolite selected from the group consisting of REY, REHY, DASY, USY, REUSY and any mixture thereof,

wherein, the total weight of the above (1), (2), (3) and (4) is not more than 40 weight parts.

19. The process for preparing the catalytic cracking catalyst according to claim 14, wherein said modified Y-type zeolite is prepared by the following process, wherein the modified Y-type zeolite is obtained by using a NaY zeolite as starting material and through three exchange steps in which a rare earth-containing substance and a phosphorus-containing substance are used and three hydrothermally treating steps, wherein, the introduction of phosphorous and rare earth is done by the exchange step; wherein independently in each exchange step, the zeolite is added to a phosphorous-containing exchanging solution or a rare earth-containing exchanging solution; wherein phosphorus is introduced at any exchange step; and wherein rare earth is introduced at any exchange step except the first exchange step.

20. The catalytic cracking catalyst according to claim 3, wherein the alumina binder is selected from a group consisting of γ -alumina, η -alumina, θ -alumina, χ -alumina, pseudoboehmite, boehmite, gibbsite, bayerite, and any mixture thereof.

21. The catalytic cracking catalyst according to claim 6, which further comprises: each of the exchange steps is conducted at 70-90°C for 1-2 hours.

22. The catalytic cracking catalyst according to claim 6, wherein each of the hydrothermally treating steps is independently conducted at 550-600°C, in a condition of 70%-100% steam for 1-2 hours.

23. The process for preparing the catalytic cracking catalyst according to claim 16, wherein the alumina binder is selected from a group consisting of γ -alumina, η -alumina, θ -alumina, χ -alumina, pseudoboehmite, boehmite, gibbsite, bayerite, and any mixture thereof.