What is claimed is:

1. An in-situ preparation method of a catalyst, wherein a Modifier is contacted with a molecular sieve in a reactor to in-situ prepare the catalyst for producing para-xylene, toluene and/or light olefins from a raw material containing methanol and/or dimethyl ether; and

the reactor is a reactor for preparing para-xylene, toluene and/or light olefins from a raw material containing methanol and/or dimethyl ether;

wherein, the molecular sieve is a formed molecular sieve formed according to type of reactors;

the formed molecular sieve is composed of a molecular sieve; or

the formed molecular sieve contains a molecular sieve and a binder;

wherein, the in-situ preparation method of the catalyst comprises at least the following steps:

(1) loading the formed molecular sieve into the reactor;

(2) feeding a feedstock containing a Modifier to the reactor;

(3) stopping feeding the feedstock containing the Modifier into the reactor, raising the temperature of the reactor to above 400°C and introducing air for calcination.

2. The method of claim 1, wherein the Modifier comprises at least one of

Modifier I: a phosphorus reagent and a silylation reagent;

Modifier II: a silylation reagent;

Modifier III: a silylation reagent and water vapor;

Modifier IV: a phosphorus reagent, a silylation reagent and water vapor.

3. The method of claim 1, wherein the catalyst is a catalyst for at least one of the following reactions:

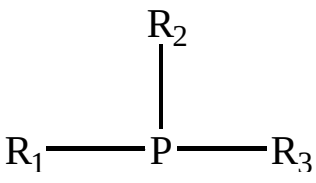
Reaction I: methanol and/or dimethyl ether, toluene to prepare light olefins and co-produce para-xylene;

Reaction II: methanol and/or dimethyl ether with benzene to prepare at least one of toluene, para-xylene and light olefins;

the reactor is a reactor in which at least one of Reaction I or Reaction II

occurs.

4. A method of claim 2, wherein the phosphorus reagent is at least one selected from the compounds having the following formula (I):



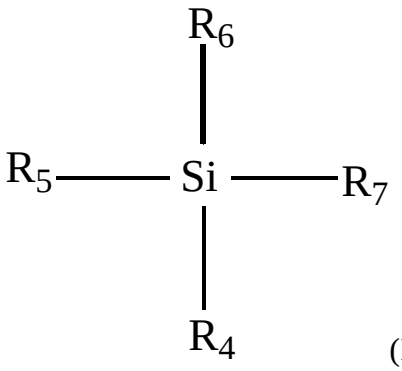
(I)

R_1, R_2 and R_3 are independently selected from C_{1-10} alkyl and C_{1-10} alkoxy; or

at least one of R_1, R_2 and R_3 in the formula (I) is selected from C_{1-10} alkoxy; or

wherein the phosphorus reagent is at least one selected from trimethoxyphosphine, triethoxyphosphine, tripropoxyphosphine, tributoxyphosphine and methyldiethoxyphosphine.

5. The method of claim 2, wherein the silylation reagent is at least one selected from the compounds having the following formula (II):



(II)

R_4, R_5, R_6 and R_7 are independently selected from C_{1-10} alkyl and C_{1-10} alkoxy; or

at least one of R_4, R_5, R_6 and R_7 in the formula (II) is selected from C_{1-10} alkoxy; or

wherein the silylation reagent is at least one selected from tetramethyl silicate, tetraethyl silicate, tetrapropyl silicate and tetrabutyl silicate.

6. The method of claim 1, wherein the reactor is at least one selected from a fixed bed reactor, a fluidized bed reactor and a moving bed reactor.

7. The method of claim 1, wherein the formed molecular sieve is prepared using one method selected from

crushing a tablet obtained by tablet compressing of the molecular sieve;

cutting a strip obtained by band extrusion of a mixture of the molecular sieve and the binder, and

spray drying of a mixture of the molecular sieve and the binder;

wherein the molecule sieve is at least one selected from the molecular sieves having MFI skeleton structure and the molecular sieves having MEL skeleton structure; or

wherein the molecular sieve is HZSM-5 molecular sieve and/or HZSM-11 molecular sieve.

8. The method of claim 1, wherein the step (2) is to feed the feedstock A containing the Modifier I into the reactor at temperature range from 130℃ to 500°C; the Modifier I comprises a phosphorus reagent and a silylation reagent;

the mass ratio of the phosphorus reagent to the silylation reagent in the feedstock A in the step (2) is:

silylation reagent: phosphorus reagent = 1:2 to 5:1;

the calcination temperature in the step (3) is in a range from 500°C to 700°C, and the calcination time is in a period ranging from 1hour to 6 hours.

9. The method of claim 1, wherein the in-situ preparation method of the catalyst comprises at least the following steps:

(1) loading the formed molecular sieve in the reactor;

(2) feeding the feedstock F containing the Modifier comprising a phosphorus reagent and a silylation reagent into the reactor;

(3) stopping feeding the feedstock F into the reactor, raising the

temperature of the reactor to above 500°C and introducing air to roast;

(4) after purging with an inactive gas, when the temperature of the reactor is raised to above 550°C, subjecting the feedstock G containing water vapor for steam treatment.

10. The method of claim 9, wherein the step (2) is to feed the feedstock F containing the Modifier comprising the phosphorus reagent and the silylation reagent into the reactor at temperature range from 130°C to 500°C;

the mass ratio of the silylation reagent to the phosphorus reagent in the feedstock F in the step (2) is:

silylation reagent: phosphorus reagent = 1:2 to 5:1;

the calcination temperature in the step (3) is in a range from 500°C to 700°C, and the calcination time is in a period ranging from 1hour to 6 hours;

the inactive gas in the step (4) is at least one selected from nitrogen, helium and argon;

the temperature of the steam treatment in the step (4) is in a range from 550°C to 800°C, and the treatment time is in a range from 1 to 10 hours.

11. The method of claim 9, wherein the feedstock G in the step (4) comprises water vapor and benzene.

12. A process for carrying out Reaction I, wherein a raw material comprising methanol and/or dimethyl ether and toluene is contacted with the catalyst obtained by in-situ and on-line preparation method of claim 1 in a reactor to prepare light olefins and co-produce para-xylene;

Reaction I is to prepare light olefins from methanol and/or dimethyl ether and toluene and co-produce para-xylene; or

Reaction I is to prepare para-xylene from methanol and/or dimethyl ether and toluene; or

Reaction I is to prepare para-xylene from methanol and toluene.

13. The method of claim 12, wherein the raw material is contacted with the catalyst at a reaction temperature ranging from 350°C to 650°C;

in the raw material containing methanol and/or dimethyl ether and toluene, the ratio of methanol and/or dimethyl ether to toluene is as follows:

the number of carbon atoms of methanol and dimethyl ether: moles of toluene = 0.5 to 10.

14. The method of claim 12, wherein the material stream I is contacted with the catalyst in the reaction system to obtain the material stream II, and the C_4 olefin or the C_{5+} chain hydrocarbon is separated from the material stream II and returned to a reaction system, light olefins and para-xylene separated from the material stream II are used as products;

the material stream I comprises methanol and/or dimethyl ether and toluene.

15. The method of claim 14, wherein the reaction system comprises a first reaction zone and a second reaction zone, and the material stream I is contacted with the catalyst in the first reaction zone to obtain the material stream II-A, the C_4 olefin or the C_{5+} chain hydrocarbon separated from the material stream II-A is fed into the second reaction zone and contacted with the catalyst to obtain the material stream II-B;

the C_4 olefin or the C_{5+} chain hydrocarbon separated from the material stream II-B is returned to the second reaction zone;

light olefins and para-xylene separated from the material stream II-A and the material stream II-B are used as products.

16. The method of claim 15, wherein the reaction system comprises a first reaction zone and a second reaction zone, and the material stream I is contacted with the catalyst in the first reaction zone to obtain a material stream II-A, the material stream II-A is fed to a separation system and the C_4 olefin or the C_{5+} chain hydrocarbon, light olefins and para-xylene are separated;

the C_4 olefin or the C_{5+} chain hydrocarbon separated in the separation system is fed into the second reaction zone to contact the catalyst to obtain a material stream II-B, the material stream II-B is fed into the separation system;

light olefins and para-xylene separated in the separation system are used

as products.

17. The method of claim 14, wherein the reaction system comprises

a first reaction zone containing a Catalyst A; and

a second reaction zone containing a Catalyst B;

wherein the Catalyst A is HZSM-5 molecular sieve catalyst modified by a phosphorus reagent and a silylation reagent, the preparation steps comprise:

(A1) a mixture of the phosphorus reagent, the silylation reagent and toluene is fed into the first reaction zone with the HZSM-5 molecular sieve at the temperature ranging from 130°C to 500°C;

(A2) the temperature is raised to above 500°C, and calcined in an air atmosphere for a period of time ranging from 1hour to 6 hours to obtain the Catalyst A;

wherein the Catalyst B is a HZSM-5 molecular sieve catalyst modified by a silylation reagent, the preparation steps comprise:

(B1) a mixture of the silylation reagent and methanol is fed into the second reaction zone with the HZSM-5 molecular sieve at the temperature ranging from 120°C to 250°C;

(B2) the temperature is raised to above 500°C, and calcined in an air atmosphere for a period of time ranging from 1hour to 6 hours to obtain the Catalyst B.

18. The method of claim 14, wherein the reaction system comprises one reactor or a plurality of reactors connected by series and/or parallel;

the reactor is at least one of a fixed bed reactor, a fluidized bed reactor or a moving bed reactor.

19. The method of claim 14, wherein the reaction system comprises a first reaction zone and a second reaction zone, and the first reaction zone and the second reaction zone are in the same reactor; or

the reaction system comprises a first reaction zone and a second reaction zone, the first reaction zone comprises one reactor or a plurality of reactors connected by series and/or parallel, and the second reaction zone comprises one reactor or a

plurality of reactors connected by series and/or parallel;

the total weight space velocity of the raw material is in a range from $0.1h^{-1}$ to $10h^{-1}$ or $0.8h^{-1}$ to $3h^{-1}$;

the molar content of toluene in the raw material is in a range from 5mol% to 50mol%.

20. A process for carrying out Reaction II, wherein a raw material comprising methanol and/or dimethyl ether and benzene is contacted with the catalyst obtained by in-situ and on-line preparation method of claim 1 in a reactor to prepare toluene and co-produce para-xylene;

Reaction II is to prepare at least one of toluene, para-xylene and light olefins from methanol and/or dimethyl ether and benzene;

the silylation reagent and the water vapor are contacted with the formed molecular sieve in the reactor to in-situ prepare the catalyst of Reaction II; and the reactor is a reactor of Reaction II;

the reactor is at least one selected from a fixed bed reactor, a fluidized bed reactor and a moving bed reactor;

the reaction temperature of Reaction II is in a range from 350°C to 600°C or 400°C to 500°C;

in the raw material containing methanol and benzene, the molar ratio of methanol to benzene is

methanol: benzene = (0.5 to 2):1.