[0009a] In an aspect, there is provided a process for alkylating hydrocarbons wherein an alkylatable organic compound is reacted with an alkylation agent to form an alkylate in the presence of a catalyst with the catalyst being subjected intermittently to a regeneration step by being contacted with a feed containing a saturated hydrocarbon and hydrogen, said regeneration being carried out at 90% or less of the active cycle of the catalyst, with the active cycle of the catalyst being defined as the time from the start of the feeding of the alkylation agent to the moment when, in comparison with the entrance of the catalyst-containing reactor section, 20% of the alkylation agent leaves the catalyst-containing reactor section without being converted, not counting isomerization inside the molecule, wherein said catalyst comprises a hydrogenation metal, solid acid constituent and one or more rare earth elements, said one or more rare earth elements comprising at least 0.3 wt % cerium calculated as fraction of the total catalyst weight, wherein the solid acid compound of the catalyst comprises from 2 wt% to 6 wt% rare earth, and the rare earth wt% is calculated as rare earth oxides on a dry basis (600°C, 1h), wherein the cerium content in the catalyst is more than 0.3 wt %.

[0009b] In another aspect, there is provided an alkylating catalyst comprising:

a. hydrogenation metal in the amount of 0.05 to 0.5 wt %

b. solid acid constituent in the form of a rare earth exchanged molecular sieve with 2-6 wt % of one or more rare earth elements, wherein the one or more rare earth elements comprises at least 5 wt % cerium calculated on the total of rare earth elements, and the rare earth wt% calculated as rare earth oxides as a dry basis (600°C, 1 h).

[0010] These and still further embodiments, features and advantages of the disclosure shall be made even more apparent by the followed detailed description, including the appended figures and claims.

BRIEF DESCRIPTION OF THE FIGURES

[0011] Figure 1 is a graph of olefin conversion over time

[0012] Figure 2 is a graph of C9+ compounds production over time

[0013] Figure 3 is a graph of olefin conversion over time

[0014] Figure 4 is a graph of C9+ compounds production over time

CLAIMS

1. A process for alkylating hydrocarbons wherein an alkylatable organic compound is reacted with an alkylation agent to form an alkylate in the presence of a catalyst with the catalyst being subjected intermittently to a regeneration step by being contacted with a feed containing a saturated hydrocarbon and hydrogen, said regeneration being carried out at 90% or less of the active cycle of the catalyst, with the active cycle of the catalyst being defined as the time from the start of the feeding of the alkylation agent to the moment when, in comparison with the entrance of the catalyst-containing reactor section, 20% of the alkylation agent leaves the catalyst-containing reactor section without being converted, not counting isomerization inside the molecule, wherein said catalyst comprises a hydrogenation metal, solid acid constituent and one or more rare earth elements, said one or more rare earth elements comprising at least 0.3 wt % cerium calculated as fraction of the total catalyst weight, wherein the solid acid compound of the catalyst comprises from 2 wt% to 6 wt% rare earth, and the rare earth wt% is calculated as rare earth oxides on a dry basis (600°C, 1h).

2. A process according to Claim 1, wherein the one or more rare earth elements comprise at least 0.5 wt % cerium calculated as fraction of the total catalyst weight.

3. A process according to Claim 1, wherein the one or more rare earth elements are comprised of cerium and lanthanum.

4. A process according to Claim 1, wherein the cerium is added to the catalyst and/or the solid acid constituent either by impregnation or by ion exchange or a combination of the two.

5. The process of claim 1 wherein the alkylatable organic compound comprises an isoparaffin or mixture of isoparaffins and the alkylation agent comprises C3-C5 alkenes or mixture of C3-C5 alkenes

6. The process of claim 5 wherein the alkylation agent is n-butene or a mixture of butenes.

7. The process of claim 5 wherein the alkylatable organic compound is isobutane

8. The process of claim 1 wherein the catalyst comprises the hydrogenation metal on a carrier comprising 2-98 wt. % of matrix material and the balance solid acid constituent.

9. The process of claim 8 wherein the catalyst carrier comprises 20-80 wt. % of matrix material and the balance solid acid constituent.

10. The process of claim 9, wherein the catalyst carrier comprises 20-50 wt. % of matrix material and the balance solid acid constituent.

11. The process of claim 8 wherein the matrix material comprises alumina.

12. The process of claim 1 wherein the solid acid constituent is a faujasite or zeolite beta.

13. The process of claim 12 wherein the solid acid constituent is a Y-zeolite.

14. The process of claim 13 wherein the solid acid constituent is prepared by a process comprising the steps of: preparing a sodium zeolite, ion exchanging the sodium zeolite with NH_4^+ - and/or rare earth ions to reduce Na_2O to about 3 – 6 wt%, steaming the zeolite at about 400 to about 500°C such that a_0 ranges from about 24.56 to about 24.72Å, ion exchanging with NH_4^+ ions to reduce Na_2O to below about 1.5 wt%, and drying.

15. The process of claim 13 wherein the solid acid constituent is prepared by a process comprising the steps of: preparing a sodium zeolite, ion exchanging the sodium zeolite with NH_4^+ - and/or rare earth ions to reduce Na_2O to about 3.5 – 4.5 wt%, steaming the zeolite at about 400 to about 500°C such that a_0 ranges from about 24.58 to about 24.68 Å, ion exchanging with NH_4^+ ions to reduce Na_2O to below about 1.0 wt%, and drying.

16. The process of claim 13 wherein the solid acid constituent is prepared by a process comprising the steps of: preparing a sodium zeolite, ion exchanging the sodium zeolite with NH_4^+ - and/or rare earth ions to reduce Na_2O to about 3.5 – 4.5 wt%, steaming the zeolite at about 400 to about 500°C such that a_0 ranges from about 24.60 to about 24.66 Å, ion exchanging with NH_4^+ ions to reduce Na_2O to below about 0.7 wt%, and drying.

17. The process of claim 15 wherein the hydrogenation function is platinum, palladium, or a mixture thereof.

18. The process of claim 1 wherein the catalyst is prepared by a) calcining solid acid-containing particles at a temperature in the range of 400-575°C, b) incorporating a Group VIII noble metal into the calcined particles to form noble metal-containing particles, and c) calcining the noble metal-containing particles at a temperature in the range of 350-600°C.

19. A process according to claim 18 wherein the temperature applied in step a) is in the range of 450-550°C.

20. A process according to claim 19 wherein the temperature is in the range of 460-500°C.

21. A process according to claim 20 wherein the temperature applied in step c) is in the range of 400-550°C.

22. A process according to claim 21 wherein the temperature is in the range of 450-500°C.

23. A process according to claim 22 wherein the solid acid is a zeolite selected from the group consisting of zeolite beta and faujasites.

24. The process according to claim 1 wherein the catalyst further comprises from about 1.5 to about 6 wt% of water (LOI600).

25. The process according to claim 24 wherein the catalyst comprises from about 1.8 to about 4 wt% of water(LOI600).

26. The process according to claim 24 wherein the catalyst comprises from about 2 to about 3 wt% of water(LOI600).

27. The process according to claim 25 wherein the solid acid is a faujasite or zeolite beta.

28. The process according to claim 27 wherein the solid acid is Y-zeolite.

29. The process according to claim 28 wherein the hydrogenation metal is a Group VIII noble metal.

30. The process according to claim 24 wherein the catalyst is prepared by adding water to a dry catalyst comprising solid acid and hydrogenation metal before use in the alkylation process.

31. The process according to claim 24 wherein the alkylation process is started using a catalyst comprising less than about 1.5 wt% water and wherein water is added to the catalyst during the alkylation process.

32. An alkylating catalyst comprising:

a. hydrogenation metal in the amount of 0.05 to 0.5 wt %

b. solid acid constituent in the form of a rare earth exchanged molecular sieve with 2-6 wt % of one or more rare earth elements, wherein the one or more rare earth elements comprises at least 5 wt % cerium calculated on the total of rare earth elements, and the rare earth wt% calculated as rare earth oxides as a dry basis (600°C, 1 h), wherein the cerium content in the catalyst is more than 0.3 wt %.

33. The catalyst according to claim 32 wherein the solid acid constituent comprises a zeolite.

34. The catalyst according to claim 33 wherein the zeolite comprises a zeolite having a faujasite structure.

35. The catalyst according to claim 34 wherein the zeolite is Y-zeolite.

36. The catalyst according to claim 35, wherein the Y-zeolite has a unit cell size in the range of 24.56-24.72 angstroms.

37. The catalyst according to claim 36, wherein the unit cell size is in the range of 24.62-24.70 angstroms.

38. The catalyst according to claim 32, wherein the solid acid comprises no more than about 1 wt % Na2O, calculated on a dry basis (600° C., 1 hour).

39. The catalyst according to claim 38, wherein the solid acid comprises no more than about 0.8 wt % Na2O calculated on a dry basis (600° C., 1 hour).

40. The catalyst according to claim 32, wherein the hydrogenation metal consists essentially of a Group VIII noble metal.

41. The catalyst according to claim 40, wherein the Group VIII noble metal is platinum.

42. The catalyst according to claim 32, wherein the catalyst additionally comprises a matrix material.

43. The catalyst according to claim 42, wherein the matrix material comprises alumina.

44. The catalyst according to claim 32, wherein the catalyst further comprises an amount of water in the range of about 1.5 to about 6 wt %.

45. The catalyst according to claim 44, wherein the amount of water is in the range of about 2 to about 4 wt %.