CLAIMS

We claim:

1. A method of producing at least one of ethylene and propylene, the method comprising:

providing a first mixture of C4+ compounds comprising a plurality of C4+ olefins in an amount of at least 30 % by weight of the first mixture of C4+ compounds; and

contacting the first mixture of C4+ compounds with a catalyst comprising:

(a) a phosphorus treated zeolite, wherein the phosphorus treated zeolite comprises an alkali metal, and wherein the alkali metal is present in an amount no greater than about 0.5 % by weight of the phosphorus treated zeolite, and

(b) a binder, wherein the binder comprises bentonite, silica and kaolin, and wherein the bentonite, silica and kaolin are present in the binder at a bentonite:silica:koalin weight ratio of about 1:8-16:20-28,

to convert at least a portion of the mixture of C4+ compounds to at least one of ethylene and propylene, thereby producing a first effluent comprising at least one of ethylene and propylene;

wherein at least 15 % by weight of the plurality of C4+ olefins is converted to at least one of ethylene and propylene.

2. The method of claim 1, wherein the mixture of C4+ compounds comprises a plurality of C4+ olefins in an amount of at least 35 % by weight of the first mixture of C4+ compounds.

3. The method of claim 1 wherein the first mixture of C4+ compounds comprises a plurality of C5 olefins in an amount of at least 10 % by weight of the first mixture of C4+ compounds.

4. The method of claim 1 wherein the first mixture of C4+ compounds comprises a plurality of C6+ olefins in an amount of at least 5 % by weight of the first mixture of C4+ compounds.

5. The method of claim 1, further comprising separating the ethylene and/or the propylene from the first effluent to form a second mixture of C4+ compounds, and contacting the second mixture of C4+ compounds with the catalyst to convert at least a portion of the

second mixture of C4+ compounds to at least one of ethylene and propylene, thereby producing a second effluent comprising at least one of ethylene and propylene.

6. The method of claim 5, further comprising separating the ethylene and/or the propylene from the second effluent to form a third mixture of C4+ compounds, and contacting the third mixture of C4+ compounds with the catalyst to convert at least a portion of the third mixture of C4+ compounds to at least one of ethylene and propylene.

7. The method of claim 1 wherein the phosphorus treated zeolite comprises phosphorus in an amount of about 0.1 % to about 10 % by weight of the phosphorus treated zeolite.

8. The method of claim 1 wherein the contacting occurs at ambient pressure.

9. The method of claim 1 wherein the contacting occurs at a pressure of about 1 psig to about 30 psig.

10. The method of claim 1 wherein the contacting occurs at a temperature of about 600 °F to about 1,300 °F.

11. The method of claim 1 further comprising steaming the catalyst prior to contacting the first mixture of C4+ compounds with the catalyst.

12. The method of claim 6, wherein at least one of the first mixture of C4+ compounds, the second mixture of C4+ compounds, and the third mixture of C4+ compounds is diluted with steam.

13. The method of claim 12, wherein at least one of the first mixture of C4+ compounds, the second mixture of C4+ compounds, and the third mixture of C4+ compounds is diluted with about 5 % to about 35 % by weight of steam, based on the weight of the first mixture of C4+ compounds, the second mixture of C4+ compounds, and the third mixture of C4+ compounds, respectively.

14. A method of producing at least one of ethylene and propylene, the method comprising:

contacting a tailstream of a methanol-to-olefin process with a catalyst comprising:

(a) a phosphorus treated zeolite, wherein the phosphorus treated zeolite comprises an alkali metal, and wherein the alkali metal is present in an amount no greater than about 0.5 % by weight of the phosphorus treated zeolite, and

(b) a binder, wherein the binder comprises bentonite, silica and kaolin, wherein the bentonite, silica and kaolin are present in the binder in a bentonite:silica:kaolin weight ratio of about 1:8-16:20-28,

thereby producing an effluent comprising at least one of ethylene and propylene,

wherein the tailstream comprises a plurality of C4+ compounds, and the catalyst converts at least a portion of the plurality of C4+ compounds to at least one of ethylene and propylene.

15. The method of claim 14, further comprising separating the ethylene and/or propylene from the tailstream to form a first effluent, and contacting the first mixture of C4+ compounds with the catalyst to convert at least a portion of the first mixture of C4+ compounds to at least one of ethylene and propylene.

16. The method of claim 15, further comprising separating the ethylene and/or propylene from the first mixture of C4+ compounds to form a second mixture of C4+ compounds, and contacting the second mixture of C4+ compounds with the catalyst to convert at least a portion of the second mixture of C4+ compounds to at least one of ethylene and propylene.

17. The method of claim 14 wherein the catalyst is a fixed bed catalyst.

18. The method of claim 17 wherein the bentonite, silica and kaolin are present in a bentonite:silica:kaolin weight ratio of about 1:10-14:22-26.

19. A method of producing at least one of ethylene and propylene, the method comprising:

providing a first mixture of C4+ compounds comprising a first plurality of C4+ olefins in an amount of at least 30 % by weight of the first mixture of C4+ compounds; and

contacting the first mixture of C4+ compounds with a catalyst comprising:

(a) a phosphorus treated zeolite, wherein the phosphorus treated zeolite comprises an alkali metal, and wherein the alkali metal is present in an amount no greater than about 0.5 % by weight of the phosphorus treated zeolite, and

(b) a binder, wherein the binder comprises bentonite, silica and kaolin, wherein the bentonite, silica and kaolin are present in the binder at a bentonite:silica:kaolin weight ratio of about 1:8-16:20-18,

to convert the first mixture to a reactor effluent comprising a second plurality of C4+ olefins and at least one of ethylene and propylene, wherein at least 15 % by weight of the first plurality of C4+ olefins of the first mixture is converted to at least one of ethylene and propylene; and

contacting the reactor effluent with the catalyst to convert at least a portion of the second plurality of C4+ olefins to at least one of ethylene and propylene.

20. The method of claim 19, wherein the catalyst is a fixed bed catalyst.