CLAIMS

We claim:

1. A method for simultaneously dimerizing and hydrating a hydrocarbon feed comprising mixed butenes, the method comprising the steps of:

introducing the hydrocarbon feed into a reaction zone in the presence of water and a dual phase catalyst system under reaction conditions that are operable to oligomerize and hydrate the butenes within the hydrocarbon feed to form a product streamcomprising mixed butanols and DIB.

2. The method as claimed in claim 1, wherein the hydrocarbon feed comprises isobutene.

3. The method as claimed in any of claims 1 or 2, wherein the hydrocarbon feed comprises at least 5% by weight isobutene.

4. The method as claimed in any of claims 1 - 3, wherein the dual phase catalyst system comprises a water soluble acid.

5. The method as claimed in any of claims 1 - 4, wherein the dual phase catalyst system comprises a water insoluble acid.

6. The method as claimed in any of claims 1 - 5, wherein the reaction zone comprises two or more reaction stages.

7. The method as claimed in any of claims 1 - 6, further comprising the step of removing the DIB and butanol from the product stream, such that the reaction equilibrium shifts to favor the forward reaction.

8. The method as claimed in any of claims 1 - 7, further comprising the step of combining the product stream with a gasoline stream to produce a gasoline product having an increased research octane number and reduced Reid vapor pressure as compared to a second gasoline product having an absence of the product stream.

9. The method as claimed in any of claims 1 - 8, wherein the dual phase catalyst system comprises a water soluble acid catalyst and a water insoluble acid catalyst.

10. The method as claimed in claim 9, wherein the water soluble acid catalyst is an organic acid selected from acetal acid, tosylate acid and perflurated acetic acid.

11. The method as claimed in claim 9, wherein the water soluble acid catalyst is an inorganic acid selected from HCl, H_3PO_4, and H_2SO_4.

12. The method as claimed in claim 9, wherein the water insoluble acid catalyst is selected from ion exchange resin, zeolite, and a supported acid.

13. A gasoline composition, the composition comprising:

a fuel-grade gasoline; and

an octane enhancing additive comprising mixed butanols and DIBs, wherein the octane enhancing composition is prepared by contacting a mixed butene stream with a dual phase catalyst system and water under conditions operable to oligomerize and hydrate the butenes to form the octane enhancing mixture.

14. The composition of claim 13, wherein octane enhancing additive is present in an amount of between about 5 and 30% by weight of the gasoline composition.

15. The composition of any of claims 13 or 14, wherein the gasoline composition has an increased RON and a decreased RVP, relative to the fuel-grade gasoline prior to being combined with the octane enchancing additive comprising the mixed butanols and DIBs.

16. A method for preparing a gasoline composition, the method comprising the steps of:

providing a fuel grade gasoline;

providing an octane enhancing composition, wherein said octane enhancing composition is prepared by contacting a mixed butene stream with a dual phase catalyst system and water under conditions operable to oligomerize and hydrate the butenes to form the octane enhancing mixture;

combining a fuel-grade gasoline and octane enhancing composition, the octane enhancing composition comprising mixed butanols and DIBs to form the gasoline composition.

17. The method of claim 16, wherein the octane enhancing composition is combined with the fuel-grade gasoline after preparation without further purification.

18. The method of any of claims 16 or 17, wherein octane enhancing additive is present in an amount of between about 5 and 30% by weight of the gasoline composition.

CLAIMS

We claim:

1. A method for simultaneously dimerizing and hydrating a hydrocarbon feed comprising mixed butenes, the method comprising the steps of:

introducing the hydrocarbon feed into a reaction zone in the presence of water and a dual phase catalyst system under reaction conditions that are operable to oligomerize and hydrate the butenes within the hydrocarbon feed to form a product stream comprising mixed butanols and DIB,

wherein the dual phase catalyst comprises a water soluble acid catalyst and a solid acid catalyst,

wherein the reaction zone is at a temperature between 100°C and 200°C, and wherein the reaction zone is at a pressure between 20 bars and 120 bars.

2. The method as claimed in claim 1, wherein the hydrocarbon feed comprises isobutene.

3. The method as claimed in any of claims 1 or 2, wherein the hydrocarbon feed comprises at least 5% by weight isobutene.

4. The method as claimed in any of claims 1 - 3, wherein the reaction zone comprises two or more reaction stages.

5. The method as claimed in any of claims 1 - 4, further comprising the step of removing the DIB and butanol from the product stream, such that the reaction equilibrium shifts to favor the forward reaction.

6. The method as claimed in any of claims 1 - 5, further comprising the step of combining the product stream with a gasoline stream to produce a gasoline product having an increased research octane number and reduced Reid vapor pressure as compared to a second gasoline product having an absence of the product stream.

7. The method as claimed in claim 1, wherein the water soluble acid catalyst is an organic acid selected from acetal acid, tosylate acid and perflurated acetic acid.

8. The method as claimed in claim 1, wherein the water soluble acid catalyst is an inorganic acid selected from HCl, H3PO4, and H2SO4.

9. The method as claimed in claim 1, wherein the solid acid catalyst is selected from ion exchange resin, zeolite, and a supported acid.

10. A gasoline composition, the composition comprising:

a fuel-grade gasoline; and

an octane enhancing additive comprising mixed butanols and DIBs, wherein the octane enhancing composition is prepared by contacting a mixed butene stream with a dual phase catalyst system and water under conditions operable to oligomerize and hydrate the butenes to form the octane enhancing mixture.

11. The composition of claim 10, wherein octane enhancing additive is present in an amount of between about 5 and 30% by weight of the gasoline composition.

12. The composition of any of claims 10 or 11, wherein the gasoline composition has an increased RON and a decreased RVP, relative to the fuel-grade gasoline prior to being combined with the octane enchancing additive comprising the mixed butanols and DIBs.

13. A method for preparing a gasoline composition, the method comprising the steps of:

providing a fuel grade gasoline;

providing an octane enhancing composition, wherein said octane enhancing composition is prepared by contacting a mixed butene stream with a dual phase catalyst system and water under conditions operable to oligomerize and hydrate the butenes to form the octane enhancing mixture,

wherein the dual phase catalyst comprises a water soluble acid catalyst and a solid acid catalyst,

wherein the water soluble acid catalyst is an organic acid selected from acetal acid, tosylate acid and perflurated acetic acid,

wherein the water soluble acid catalyst is an inorganic acid selected from HCl, H3PO4, and H2SO4,

wherein the solid acid catalyst is selected from ion exchange resin, zeolite, and a supported acid;

combining a fuel-grade gasoline and octane enhancing composition, the octane enhancing composition comprising mixed butanols and DIBs to form the gasoline composition.

14. The method of claim 13, wherein the octane enhancing composition is combined with the fuel-grade gasoline after preparation without further purification.

15. The method of any of claims 13 or 14, wherein octane enhancing additive is present in an amount of between about 5 and 30% by weight of the gasoline composition.