implementation of the present invention in a fixed bed process. The system 100 includes a reactor 110 which can be in the form of a fixed bed reactor vessel. A catalyst is loaded within a zone or region 112 that is within the reactor 110 as shown. In the illustrated embodiment, the catalyst is centrally located within the reactor 110. The reactor 110 itself is disposed within a hotbox which is generally shown at 120.

The reactants are delivered to the reactor 110 in the following manner. A source of feedstock (e.g., the mixed butenes feed) is identified at 130 and the source 130 is fluidly connected (e.g., by means of a fluid conduit 131 (such as a pipe)) to a storage receptacle 140 to allow the feedstock to be stored in the storage receptacle 140. As mentioned herein, the feedstock is typically a liquid stream.

A valve or flow control device 145 is disposed along the conduit to control the flow of the feedstock to both the storage receptacle 140 and the reactor 110. In addition, a means 150 for delivering the feedstock (mixed butenes) into the reactor 110 at a desired rate is provided. The means 150 is in communication with the storage receptacle 140 via a conduit 141 and is configured to operatively cause the feedstock to be delivered at a desired flow rate to the reactor 110. In one embodiment, the means 150 is in the form of a gas source (such as N_2) that is used to press the liquid feedstock into the reactor 110 at a desired rate (flow rate). The gas source 150 is connected to the storage receptacle 140 by means of a conduit (e.g., pipe) that can include a valve or the like 155 for controlling the flow of the gas to the storage receptacle 140.

The valve 145 can be placed into a position that closes off the flow from the source 130 to the storage receptacle 140; however, the combined gas (from source 150) and the stored feedstock within the storage receptacle 140 are permitted to flow

CLAIMS

1. A process for dimerizing and oligomerizing a mixed olefins feed comprising mixed olefins to produce mixed higher olefins, said process comprising the steps of:

introducing the mixed olefins feed into a reactor vessel under oligomerization conditions, wherein the mixed olefins feed comprises at least two butene isomers;

contacting the mixed olefins feed with an ion-exchange resin based catalyst within the reactor vessel to convert the mixed olefins into the mixed higher olefins; and

producing a product stream comprising the mixed higher olefins from the reactor vessel;

wherein the process is a single stage, single pass process and the mixed olefins feed comprises at least two different types of olefins having 2 to 5 carbons and the mixed higher olefins comprises: (1) olefins having 8 carbons and (2) olefins having more than 8 carbons; and

wherein single pass conversion rates for the at least two butene isomers are greater than 50%.

2. The process of claim 1, wherein the mixed olefins feed comprises 1-butene, trans-2-butene, cis-2-butene, and iso-butene.
3. The process of claim 1, where the ion-exchange resin based catalyst comprises a sulfonic acid cation exchanger in the hydrogen form.
4. The process of claim 1, wherein the mixed higher olefins comprises diisobutene (DIB).

5. The process of claim 1, wherein the mixed higher olefins comprise at least 50% by weight olefins having 8 carbons and at least 20% by weight olefins having 12 carbons.
6. The process of claim 1, wherein the olefins having more than 8 carbons comprise: (a) olefins having 12 carbons, (b) olefins having 16 carbons; and (c) olefins having 20 carbons.
7. The process of claim 1, wherein a portion of the olefins having 8 carbons that are formed as part of the product comprises highly branched olefins including dimethyl-hexene and trimethyl-pentene.
8. The process of claim 1, where the reactor vessel is maintained at a temperature of between 30-180°C.
9. The process of claim 1, further including the step of introducing into the reactor a catalyst promoter which comprises a polar compound.
10. The process of claim 9, wherein the promoter is at least one of water and butanol.
11. A process for producing a fuel composition from mixed butenes using a butene dimerization/oligomerization system, the process comprises the step of:

introducing a mixed butenes stream comprising the mixed butenes into a reactor vessel that is part of the dimerization/oligomerization system under oligomerization conditions;

contacting the mixed butenes stream with an ion-exchange resin based catalyst within the reactor vessel to convert the mixed butenes into a product stream comprising mixed olefins that include branched olefins having 8 carbons and olefins having more than 8 carbons; and

combining the product stream with a fuel component to produce the fuel composition;

wherein the mixed butenes comprise n-butene, trans-2-butene, iso-butene, and cis-2-butene;

wherein the process is a single-stage, single pass process and the single pass conversion rates for each of n-butene, trans-2-butene, iso-butene, and cis-2-butene are greater than 50%; and

wherein the fuel component comprises gasoline, diesel, jet fuel, aviation gasoline, heating oil, bunker oil, or a combination thereof.

12. The process of claim 11, wherein the mixed olefins include diisobutene (DIB).
13. The process of claim 12, wherein the mixed olefins comprise at least 50% by weight olefins having 8 carbons and at least 20% by weight olefins having more than 8 carbons.
14. The process of claim 12, wherein the olefins having more than 8 carbons comprise: (a) olefins having 12 carbons, (b) olefins having 16 carbons; and (c) olefins having 20 carbons.