[0076] It has also been found that using a smaller effective diameter, the stability of the MgO catalyst can be improved even without adding a stabilizing agent. Thermal aging was carried out at 650°C for a period of 24 h. Thermal aging at this higher temperature of 650°C is considered to be a severe thermal aging test for the MgO catalyst.

[0077] Example 5

[0078] A 5 mm MgO tablet prepared without using a stabilizing agent was subjected to severe thermal aging by treating the tablet at 650°C for a period of 24 h. Figure 2 shows the change in the pore volume as well as the BET surface area of the tablet after the severe thermal aging. Initial BET surface area of the 5 mm MgO tablet was 202 m^2/g and after the thermal aging, the surface area reduced to 36 m^2/g. Also, the average pore diameter increased to about 28 nm from a broader range but smaller diameter from 3-10 nm. After thermal aging the full width at half maximum (FWHM) was measured to be 15.2 nm.

[0079] Example 6

[0080] A 3 mm MgO tablet prepared using the identical MgO and no stabilizing agent. It was then subjected to severe thermal aging by treating the tablet at 650°C for a period of 24 h. Figure 2 shows the change in the pore volume as well as the BET surface area of the tablet after the severe thermal aging. Initial BET surface area of the ~~5~~ 3 mm MgO tablet was 183 m^2/g and after the thermal aging, the surface area reduced to 56 m^2/g. Also, the average pore diameter increased to about 18 nm from a smaller diameter of about 8 nm. After thermal aging the full width at half maximum (FWHM) was measured to be 6.2 nm. Comparing the 5mm MgO tablet in Example 5 with the 3 mm MgO tablet in Example 6, the smaller effective diameter tablet retains a higher BET surface area after the severe thermal aging treatment. Also, the average pore diameter after the thermal aging is lower with the 3mm tablet compared to the 5mm tablet. The pore distribution is also narrower with the 3mm MgO tablet after the thermal aging compared to the 5mm MgO tablet, as seen by the differences in the full width at half maximum(FWHM) for the two sizes. 3mm tablet shows a FWHM of 6.2 nm compared to a FWHM of 15.2 for the 5mm tablet.

[0081] As described in the examples above, improvements in MgO catalyst stability is achieved by utilizing a catalyst of lower effective diameter.

CLAIMS

What is claimed:

1. A process for the double-bond isomerization of olefins, the process comprising:

contacting a fluid stream comprising olefins with a fixed bed comprising an activated basic metal oxide isomerization catalyst having an effective diameter in the range of 0.25 mm to ~~4.0~~1.5 mm to convert at least a portion of the olefin to its isomer.

2. The process of claim 1, wherein the basic metal oxide isomerization catalyst comprises at least one of magnesium oxide, calcium oxide, strontium oxide, barium oxide, lithium oxide, and combinations thereof.
3. The process of claim 1, wherein the basic metal oxide isomerization catalyst comprises magnesium oxide.
~~4. The process of claim 1, wherein the effective diameter of the catalyst is in the range from about 0.5 mm to about 3.2 mm.~~
~~5.~~ 4. The process of claim 1 wherein the catalyst is in the form of a tablet or an extrudate.

6. 5. A process for the production of propylene, comprising:

fractionating a hydrocarbon stream comprising n-butenes, isobutene, and paraffins into at least two fractions including a light C_4 fraction comprising isobutene and a heavy C_4 fraction comprising n-butenes and paraffins;

feeding ethylene and the heavy C_4 fraction to a fixed bed reactor comprising a metathesis catalyst and activated basic metal oxide isomerization catalyst wherein the isomerization catalyst has an effective diameter between 0.25 and 4.01.5 mm and does not contain a stabilizing agent;

contacting the heavy C_4 fraction with the activated basic metal oxide isomerization catalyst to convert at least a portion of the 1-butene to 2-butene; and

contacting the ethylene and at least a portion of the 2-butene with a the metathesis catalyst to form a metathesis product comprising propylene, paraffins, any unreacted ethylene, and any unreacted 1-butene and 2-butene.

7. 6. The process of claim 65, further comprising fractionating the metathesis product to recover an ethylene fraction, a propylene fraction, and a C_4 fraction.

~~8.~~ 7. The process of claim 6 further comprising recycling at least a portion of the C_4 fraction to the fractionating a hydrocarbon stream.

~~9.~~ 8. The process of claim ~~6~~5, further comprising recycling at least a portion of the ethylene fraction to the fixed bed reactor.

~~10.~~ 9. The process of claim ~~6~~5, further comprising maintaining a ratio of ethylene to n-butene fed to the fixed bed reactor in a range from about 0.5 to about 2.5.

~~11.~~ 10. The process of claim ~~10~~9, wherein the ratio of ethylene to n-butene fed is at least 1.0.

~~12.~~ 11. The process of claim ~~6~~5, wherein the metathesis catalyst is admixed with the isomerization catalyst.

~~13.~~ 12. The process of claim ~~6~~5, wherein the fixed bed reactor comprises a bed of the metathesis catalyst and a bed of the isomerization catalyst.

~~14.~~ 13. The process of claim ~~6~~5, wherein the hydrocarbon stream further comprises butadiene, the process further comprising hydrogenating at least a portion of the butadiene prior to the fractionating.

~~15.~~ 14. The process of claim ~~6~~5, wherein the basic metal oxide isomerization catalyst comprises at least one of magnesium oxide, calcium oxide, strontium oxide, barium oxide, lithium oxide, and combinations thereof.

~~16.~~ 15. The process of claim ~~6~~5, wherein the basic metal oxide isomerization catalyst comprises magnesium oxide.

~~17. The process of claim 6, wherein the catalyst has an effective diameter in the range from about 1.0 mm to about 3.5 mm.~~

~~18. The process of claim 6, wherein the catalyst has an effective diameter in the range from about 1.5 mm to about 3.2 mm.~~

~~19.~~ 16. The process of claim ~~6~~5 wherein the catalyst is in the form of a tablet or extrudate.