or hexene 2 or hexene-3 to hexene-1. For both of these systems there is a need to reduce the cycle to cycle deactivation thus maintaining higher activity over the complete catalyst life cycle.

SUMMARY OF THE DISCLOSURE

[0024] In one aspect, embodiments disclosed herein relate to a process for the double-bond isomerization of olefins, the process including: contacting a fluid stream comprising olefins with a fixed bed comprising an activated basic metal oxide isomerization catalyst comprising a structure stabilizing agent, to convert at least a portion of the olefin to its isomer.

[0025] In another aspect, embodiments disclosed herein relate to a process for the double-bond isomerization of olefins, the process including: 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 1.5 mm to convert at least a portion of the olefin to its isomer.

[0026] In another aspect, embodiments disclosed herein relate to a process for the production of propylene, including: 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 an activated basic metal oxide isomerization catalyst comprising a structure 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 ethylene and at least a portion of the 2-butene with a metathesis catalyst to form a metathesis product comprising propylene, paraffins, any unreacted ethylene, and any unreacted 1-butene and 2-butene.

[0027] In another aspect, embodiments disclosed herein relate to a process for the production of propylene, including: 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

1.5 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 the metathesis catalyst to form a metathesis product comprising propylene, paraffins, any unreacted ethylene, and any unreacted 1-butene and 2-butene.

[0028] Other aspects and advantages will be apparent from the following description and the appended claims.

BRIEF DESCRIPTION OF DRAWINGS

[0029] Figure 1 is a graphical representation of changes in BET surface area of MgO tablets containing a structure stabilizing agent, as a function of thermal aging.

[0030] Figures 2A and 2B are graphical representations of changes in BET surface area and pore structure of MgO tablets of different sizes, after severe thermal aging at 650°C (2A = 5 mm, 2B = 3 mm catalyst effective diameters).

[0031] Figure 3 is a simplified process flow diagram of a process for isomerization and metathesis using catalysts according to embodiments disclosed herein.

[0032] Figure 4 is a graphical illustration of catalyst activity over time for catalysts according to embodiments disclosed herein as compared to typical magnesium oxide catalysts when used in the presence of ethylene.

[0033] Figures 5 is a graphical illustration of the comparison of 1-butene conversion over cumulative age for different particle size MgO catalysts in metathesis service for propylene for both initial and 5th cycles.

DETAILED DESCRIPTION

[0034] In one aspect, embodiments disclosed herein relate to the improvement in the stability of the isomerization catalyst surface area over multiple regenerations by the addition of a structure stabilizing agent. In another aspect, embodiments disclosed herein relate to the improvement in the stability of the isomerization catalyst surface area over multiple regenerations by the reduction of the effective diameter of the isomerization catalyst without the addition of a stabilizing agent.

[0035] In further aspects, embodiments disclosed herein relate generally to the processing of a C_3 to C_6 hydrocarbon cut from a cracking process, such as steam or fluid catalytic cracking, primarily for conversion of C_4 olefins to propylene via metathesis. More specifically, embodiments disclosed herein relate to a catalyst for the metathesis of