CLAIMS

1. A process for production of propylene comprising:

providing a dual catalyst system comprising:

a mesoporous silica catalyst impregnated with metal oxide, where the mesoporous silica catalyst includes a pore size distribution of about 2.5 nm to about 40 nm and a total pore volume of at least about 0.600 cm^3/g, and

a mordenite framework inverted (MFI) structured silica catalyst downstream of the mesoporous silica catalyst, where the MFI structured silica catalyst includes a total acidity of 0.001 mmol/g to 0.1 mmol/g,

producing propylene from a stream comprising butene via metathesis and cracking by contacting the stream comprising butene with the dual catalyst system, where the stream comprising butene contacts the mesoporous silica catalyst before contacting the MFI structured silica catalyst.

2. The process of claim 1 where the MFI structured silica catalyst has a pore size distribution of at least 1.5 nm to 3 nm.

3. The process of claim 1 where the MFI structured silica catalyst is free of acidity modifiers selected from the group consisting of rare earth modifiers, phosphorus modifiers, potassium modifiers, and combinations thereof.

4. The process of claim 1 where the mesoporous silica catalyst catalyzes isomerization of 2-butene to 1-butene followed by cross-metathesis of 2-butene and 1-butene into a metathesis product stream comprising propylene, and the MFI structured silica catalyst is a cracking catalyst which produces propylene from C_4 or C_5 olefins in the metathesis product stream.

5. The process of claim 1 where the metal oxide of the mesoporous silica catalyst comprises one or more oxides of molybdenum, rhenium, tungsten, or combinations thereof.

6. The process of claim 1 where the metal oxide of the mesoporous silica catalyst is tungsten oxide (WO_3).

7. The process of claim 1 where the mesoporous silica catalyst has a molar ratio for silica/tungsten oxide of 5 to 60.

8. The process of claim 1 where the mesoporous silica catalyst includes a surface area of 250 m^2/g to 600 m^2/g.

9. The process of claim 1 where the mesoporous silica catalyst has a particle size of 20 nm to 200 nm, and an individual crystal size ranging from 1 to 100 μm.

10. The process of claim 1 where the MFI structured silica catalyst is alumina free.

11. The process of claim 1 where the MFI structured silica catalyst comprises alumina.

12. The process of claim 11 where the MFI structured silica catalyst has a molar ratio of silica to alumina of 200 to 3000.

13. The process of claim 1 where the MFI structured silica catalyst has a surface area of 300 m^2/g to 425 m^2/g, and a crystal size of 10 μm to 40 μm.

14. The process of claim 1 where the process achieves at least a 20 mol. % conversion of ethylene and a propylene yield in mol. % of at least 45%.