CLAIMS:

1. A method for converting hydrocarbons, comprising:

an oxidizing step comprising exposing a portion of a hydroperoxide-containing feed comprising tert-butyl hydroperoxide to a solid deperoxidation catalyst under decomposition conditions to form an oxidation effluent comprising tert-butyl alcohol, wherein the decomposition conditions comprise a temperature of about 50°C to about 170°C and a pressure of about 10 psig to about 500 psig, wherein the solid deperoxidation catalyst comprises a manganese oxide octahedral molecular sieve, wherein the manganese oxide octahedral molecular sieve comprises a MnO_6 octahedra which share edges to form a tunnel structure, wherein the oxidizing step further comprises exposing an isoparaffin-containing feed comprising isobutane to oxidation conditions in the presence of oxygen to form the hydroperoxide-containing feed, wherein at least about 10 wt% of the isobutane in the isoparaffin-containing feed is converted to tert-butyl alcohol, and the isoparaffin-containing feed optionally comprises at least about 80 wt% isobutane relative to a weight of the isoparaffin-containing feed, wherein the oxidation conditions comprise a temperature of about 100°C to about 200°C and a pressure of about 200 psig to about 1000 psig;

a dehydrating and/or dimerizing step comprising directly exposing a portion of the oxidation effluent to a first solid acid catalyst under dehydrating and/or dimerizing conditions to form an isoolefin-containing effluent comprising 2,4,4-trimethylpent-1-ene and/or 2,4,4-trimethylpent-2-ene, wherein at least about 70 wt% of tert-butyl alcohol is converted to 2,4,4-trimethylpent-1-ene and/or 2,4,4-trimethylpent-2-ene; and

a hydrogenating step comprising directly exposing a portion of the isoolefin-containing effluent to a second solid acid catalyst and hydrogen under hydrogenation conditions to form an alkylation effluent comprising a C_8 fraction comprising at least 50 wt% of 2,3,4-, 2,3,3- and 2,2,4-trimethylpentane having an octane rating, as determined by (RON+MON)/2, of at least about 90, relative to a weight of the C_8 fraction, wherein the first solid acid catalyst and the second solid acid catalyst are the same or different.

2. The method of claim 1, wherein at least about 70% of the tert-butyl hydroperoxide is converted to tert-butyl alcohol and/or the solid deperoxidation

catalyst has a selectivity of at least about 70% for conversion of tert-butyl hydroperoxide to tert-butyl alcohol.

3. The method of claim 1, wherein at least about 90% of the tert-butyl hydroperoxide is converted to tert-butyl alcohol and/or the solid deperoxidation catalyst has a selectivity of at least about 90% for conversion of tert-butyl hydroperoxide to tert-butyl alcohol.

4. The method of claim 1, wherein the tunnel structure is 2 x 2 tunnel structure or 3 x 3 tunnel structure.

5. The method of claim 1, wherein the solid deperoxidation catalyst is selected from the group consisting of OMS-2, Nb-OMS-2, K-OMS-2, OMS-1, amorphous manganese oxide and a combination thereof.

6. The method of claim 1, wherein the oxidation effluent comprises a molar ratio of isobutane to tert-butyl alcohol of about 0 : 1 to about 2 : 1.

7. The method of claim 1, wherein a portion of the oxidation effluent further comprises water, one or more oxygenates, or a combination thereof, and the one or more oxygenates optionally comprises water, methanol, an ester, acetone, or a combination.

8. The method of claim 7, wherein the ratio by weight of tert-butyl alcohol to methanol in the oxidation effluent is from about 10:1 to about 25:1; the ratio by weight of tert-butyl alcohol to acetone is from about 4:1 to about 20:1, or both.

9. The method of claim 1, further comprising one or more of:

exposing an n-paraffin-containing feed comprising n-butane to a bifunctional acid catalyst to form the isoparaffin-containing feed via isomerization;

separating a portion of n-butane and/or isobutane from the alkylation effluent to form a first recycle stream;

separating a portion of n-butane and/or isobutane from the oxidation effluent to form a second recycle stream; and

recycling a portion of the first recycle stream and/or the second recycle stream to the n-paraffin-containing feed and/or the isoparaffin-containing feed.

10. The method of claim 1, wherein the first and/or second solid acid catalyst comprises a zeolite, a mixed metal oxide or a combination thereof.

11. The method of claim 1, wherein the first and/or second solid acid catalyst comprises a crystalline microporous material of the MWW framework topology selected from the group consisting of MCM-22, PSH-3, SSZ-25, ERB-1, ITQ-1, ITQ-2, MCM-36, MCM-49, MCM-56, EMM-10, EMM-12, EMM-13, UZM-8, UZM-8HS, UZM-37, MIT-1, and a mixture thereof.

12. The method of claim 1, wherein the first and/or second solid acid catalyst comprises a mixed metal oxide based on oxides of Fe/W/Zr, W/Zr, Ce/W/Zr, Cu/W/Zr, Mn/W/Zr, or a combination thereof.

13. The method of claim 1, wherein the first and/or second solid acid catalyst further comprises an inorganic oxide binder, optionally wherein, the inorganic oxide binder comprises alumina, silica or a combination thereof.

14. The method of claim 1, wherein the dehydrating and/or dimerizing conditions comprise a temperature about 100°C to about 210°C.