CLAIMS:

What is claimed is:

1. A catalyst composition comprising 0.001 wt% to 0.025 wt% of Pt and up to 10 wt% of a promoter comprising Sn, Cu, Au, Ag, Ga, a combination thereof, or a mixture thereof disposed on a support, the support comprising at least 0.5 wt% of a Group 2 element, wherein all weight percent values are based on the weight of the support.

2. The catalyst composition of claim 1, wherein the promoter comprises Sn.

3. The catalyst composition of claim 1 or 2, further comprising an alkali metal element comprising Li, Na, K, Rb, Cs, or a combination thereof, or a mixture thereof disposed on the support in an amount of up to 5 wt% based on the weight of the support.

4. The catalyst composition of any of claims 1 to 3, wherein the catalyst composition is in the form of particles having a size and particle density that is consistent with a Geldart A or Geldart B definition of a fluidizable solid.

5. The catalyst composition of any of claims 1 to 4, wherein:
the Group 2 element comprises Mg, and
at least a portion of the Group 2 element is in the form of MgO or a mixed metal oxide comprising Mg.

6. The catalyst composition of any of claims 1 to 5, wherein:
the Group 2 element comprises Mg, and
at least a portion of the Group 2 element is in the form of a mixed Mg/Al metal oxide.

7. The catalyst composition of any of claims 1 to 6, wherein:
the support further comprises a Group 13 element,
the Group 2 element comprises Mg and the Group 13 element comprises Al,
the support comprises a mixed Mg/Al metal oxide, and

a weight ratio of the Mg to the Al in the mixed Mg/Al metal oxide is in a range from 0.001 to 1,000.

8. The catalyst composition of any of claims 1 to 7, wherein:

the support further comprises a Group 13 element,

the promoter comprises Sn, the Group 2 element comprises Mg, and the Group 13 element comprises Al,

the catalyst composition comprises 0.001 wt% to 0.025 wt% of the Pt and 0.25 wt% to 10 wt% of the Sn based on the weight of the support,

the support comprises a mixed Mg/Al metal oxide, and

a weight ratio of the Mg to the Al in the mixed Mg/Al metal oxide is in a range from 0.001 to 1,000.

9. A process for making a catalyst composition, comprising:

(I) preparing a slurry or a gel comprising a compound containing a Group 2 element and a liquid medium;

(II) spray drying the slurry or the gel to produce spray dried particles comprising the Group 2 element; and

(III) calcining the spray dried particles under an oxidative atmosphere to produce calcined support particles comprising the Group 2 element,

wherein, at least one of (i), (ii), and (iii) is met:

(i) Pt is present in the slurry or the gel in the form of a Pt-containing compound and the catalyst composition comprises catalyst particles comprising the calcined support particles having Pt disposed thereon,

(ii) Pt is deposited on the spray dried particles by contacting the spray dried particles with a Pt-containing compound to produce Pt-containing spray dried particles and the catalyst composition comprises catalyst particles comprising the calcined support particles having Pt disposed thereon, and

(iii) Pt is deposited on the calcined support particles by contacting the calcined support particles with a Pt-containing compound to produce Pt-containing calcined support particles and the process further comprises (IV) calcining the Pt-containing calcined support particles to produce re-calcined support particles having Pt disposed thereon, wherein the catalyst composition comprises the re-calcined support particles,

and wherein, at least one of (iv), (v), and (vi) is met:

(iv) a compound comprising a promoter element is present in the slurry or the gel and the catalyst composition comprises catalyst particles comprising the calcined support particles having the promoter element disposed thereon,

(v) a compound comprising a promoter element is deposited on the spray dried particles to produce promoter-containing spray dried particles and the catalyst composition comprises catalyst particles comprising the calcined support particles having the promoter element disposed thereon, and

(vi) a compound comprising a promoter element is deposited on the calcined support particles to produce promoter-containing calcined support particles and the process further comprises (V) calcining the promoter-containing calcined support particles to produce re-calcined support particles having the promoter element disposed thereon, wherein the catalyst composition comprises the re-calcined support particles,

wherein:

the promoter element comprises Sn, Cu, Au, Ag, Ga, a combination thereof, or a mixture thereof,

the catalyst particles comprise the Pt in an amount of from 0.001 wt% to 0.025 wt% and the promoter element in an amount of up to 10 wt% based on the weight of the calcined support particles or the re-calcined support particles, and

the catalyst particles comprise at least 0.5 wt% of the Group 2 element based on the weight of the calcined support particles or the re-calcined support particles.

10 The process of claim 9, wherein the spray dried particles are calcined at a temperature in a range of from 550°C to 900°C for a time period of ≤ 45 minutes.

11. The process of claim 9, wherein the spray dried particles are calcined at a temperature of < 550°C for a time period of ≤ 45 minutes.

12. The process of any of claims 9 to 11, wherein the Pt-containing compound is present in the slurry or the gel.

13. The process of any of claims 9 to 12, wherein the Pt-containing compound is deposited on the spray dried particles.

14. The process of any of claims 9 to 13, wherein the Pt-containing compound is deposited on the calcined support particles and the process further comprises step (IV).

15. The process of any of claims 9 to 14, wherein the compound comprising the promoter element is present in the slurry or the gel.

16. The process of any of claims 9 to 15, wherein the compound comprising the promoter element is deposited on the spray dried particles.

17. The process of any of claims 9 to 16, wherein the compound comprising the promoter element is deposited on the calcined support particles and the process further comprises step (V).

18. The process of any of claims 9 to 17, further comprising:

(VI) hydrating the calcined support particles after step (III) to produce hydrated support particles; and

(VII) calcining the hydrated support particles to produce the catalyst composition comprising re-calcined support particles, wherein the re-calcined support particles produced via steps (VI) and (VII) have an attrition loss after one hour that is less than an attrition loss after one hour of the calcined support particles produced in step (III), as measured according to ASTM D5757-11(2017).

19. The process of any of claims 10 to 18, wherein:

the Group 2 element comprises Mg, and

at least a portion of the Group 2 element is in the form of MgO or a mixed metal oxide comprising Mg.

20. A process for upgrading a hydrocarbon, comprising:

(I) contacting a hydrocarbon-containing feed with a catalyst composition comprising Pt and a promoter disposed on a support to effect one or more of dehydrogenation, dehydroaromatization, and dehydrocyclization of at least a portion of

the hydrocarbon-containing feed to produce a coked catalyst composition and an effluent comprising one or more upgraded hydrocarbons and molecular hydrogen, wherein:

the hydrocarbon-containing feed comprises one or more of C_2-C_{16} linear or branched alkanes, or one or more of C_4-C_{16} cyclic alkanes, or one or more C_8-C_{16} alkyl aromatics, or a mixture thereof,

the hydrocarbon-containing feed and catalyst composition are contacted at a temperature in a range of from 300°C to 900°C, for a time period of ≤ 3 hours, under a hydrocarbon partial pressure of at least 20 kPa-absolute, wherein the hydrocarbon partial pressure is the total partial pressure of any C_2-C_{16} alkanes and any C_8-C_{16} alkyl aromatics in the hydrocarbon-containing feed,

the support comprises at least 0.5 wt% of a Group 2 element based on the weight of the support,

the catalyst composition comprises from 0.001 wt% to 0.025 wt% of the Pt and up to 10 wt% of the promoter based on the weight of the support,

the promoter comprises Sn, Cu, Au, Ag, Ga, a combination thereof, or a mixture thereof, and

the one or more upgraded hydrocarbons comprise at least one of a dehydrogenated hydrocarbon, a dehydroaromatized hydrocarbon, and a dehydrocyclized hydrocarbon.

21. The process of claim 20, further comprising:

(II) contacting at least a portion of the coked catalyst composition with an oxidant to effect combustion of at least a portion of the coke to produce a regenerated catalyst composition lean in coke and a combustion gas; and

(III) contacting an additional quantity of the hydrocarbon-containing feed with at least a portion of the regenerated catalyst composition to produce a re-coked catalyst composition and additional effluent, wherein a cycle time from contacting the hydrocarbon-containing feed with the catalyst composition in step (I) to contacting the additional quantity of the hydrocarbon-containing feed with the regenerated catalyst composition in step (III) is ≤ 5 hours.

22. The process of claim 20 or claim 21, wherein the hydrocarbon-containing feed comprises propane, and wherein contacting the hydrocarbon-containing feed with the

catalyst composition in step (I) has a propylene yield of at least 52 % at a propylene selectivity of ≥ 85%.

23. The process of any of claims 20 to 22, wherein:

the Group 2 element comprises Mg, and

at least a portion of the Group 2 element is in the form of MgO or a mixed metal oxide comprising Mg.