CLAIMS

1. A process of forming an oligomerization product comprising:

contacting an olefin and a catalyst system to form an oligomerization product at oligomerization conditions, wherein a reaction system effluent comprises components selected from the oligomerization product, a chromium containing compound, or combinations thereof; and

adding a beta-diketone to the chromium containing compound in i) the reaction system effluent, ii) a deactivated reaction system effluent, iii) a deactivated and quenched reaction system effluent, or iv) a reaction system effluent stream, a deactivated reaction system effluent stream, or a deactivated and quenched reaction system effluent stream which has been processed to remove one or more materials comprising all or a portion of ethylene, the oligomerization product, and/or reaction solvent, at conditions capable of changing an oxidation state of chromium.

2. The process of claim 1, wherein the beta-diketone is added to the chromium containing compound in the presence of the oligomerization product.

3. The process of claim 1, further comprising separating at least a portion of the components within the reaction system effluent.

4. The process of claim 3, wherein the separation comprises at least one separation vessel selected from columns, tanks, flash vessels, distillation columns, or combinations thereof, and wherein the beta-diketone is added to the chromium containing compound at one or more locations within the separation.

5. The process of claim 3, wherein the beta-diketone is added to the chromium containing compound prior to separation of the components.

6. The process of claim 1, further comprising:

separating light boiling components from heavier boiling components present in the reaction system effluent within a first vessel to form a first vessel overhead stream and a first vessel bottoms stream, wherein the first vessel bottoms stream comprises at least a portion of the chromium containing compound; and

adding the beta-diketone to the first vessel bottoms stream.

7. The process of claim 6, wherein the first vessel comprises a flash vessel.

8. The process of claim 1, further comprising:

separating light boiling components from heavier boiling components present in the reaction system effluent within a first vessel to form a first vessel overhead stream and a first vessel bottoms stream, wherein the first vessel bottoms stream comprises the chromium containing compound;

passing the first vessel bottoms stream to a second vessel adapted to separate the components therein and form a second vessel overhead stream and a second vessel bottoms stream, wherein the second vessel bottoms stream comprises at least a portion of the chromium containing compound; and

adding the beta-diketone to the second vessel bottoms stream.

9. The process of claim 1, further comprising:

separating light boiling components from heavier boiling components present in the reaction system effluent within a first vessel to form a first vessel overhead stream and a first vessel bottoms stream, wherein the first vessel bottoms stream comprises at least a portion of the chromium containing compound;

passing the first vessel bottoms stream to a second vessel adapted to separate the components therein and form a second vessel overhead stream and a second vessel bottoms stream, wherein the second vessel bottoms stream comprises at least a portion of the chromium containing compound;

passing the second vessel bottoms stream to a third vessel adapted to separate the components therein and form a third vessel overhead stream and a third vessel bottoms stream, wherein the third vessel bottoms stream comprises at least a portion of the chromium containing compound; and

adding the beta-diketone to the third vessel bottoms stream.

10. The process of claim 1, further comprising:

storing at least a portion of the reaction system effluent within a storage vessel; and

wherein the at least a portion of the reaction system effluent comprises at least a portion of the chromium containing compound; and

adding the beta-diketone to the reaction system effluent within the storage vessel.

11. The process of claim 1, further comprising:

separating light boiling components from heavier boiling components present in the reaction system effluent within a first vessel to form a first vessel overhead stream and a first vessel bottoms stream, wherein the first vessel bottoms stream comprises the chromium containing compound;

passing the first vessel bottoms stream to a second vessel adapted to separate the components therein and form a second vessel overhead stream and a second vessel bottoms stream, wherein the second vessel bottoms stream comprises at least a portion of the chromium containing compound;

passing the second vessel bottoms stream to a third vessel adapted to separate the components therein and form a third vessel overhead stream and a third vessel bottoms stream, wherein the third vessel bottoms stream comprises at least a portion of the chromium containing compound;

storing at least a portion of the third vessel bottoms stream within a storage vessel; and

adding the beta-diketone to the third vessel bottoms stream within the storage vessel.

12. The process of claim 1, further comprising:

separating light boiling components from heavier boiling components present in the reaction system effluent within a first vessel to form a first vessel overhead stream and a first vessel bottoms stream, wherein the first vessel bottoms stream comprises at least a portion of the chromium containing compound;

passing the first vessel bottoms stream to a second vessel adapted to separate the components therein and form a second vessel overhead stream and a second vessel bottoms stream, wherein the second vessel bottoms stream comprises at least a portion of the chromium containing compound;

passing the second vessel bottoms stream to a third vessel adapted to separate the components therein and form a third vessel overhead stream and a third vessel bottoms stream, wherein the third vessel bottoms stream comprises at least a portion of the chromium containing compound;

storing at least a portion of the third vessel bottoms stream within a storage vessel; and

adding the beta-diketone to a) the reaction system effluent, b) the first vessel bottoms stream, c) the second vessel bottoms stream, d) the third vessel bottoms stream, e) the reaction

system effluent, the first vessel bottoms stream, the second vessel bottoms stream, or the third vessel bottoms stream within the storage vessel, or f) combinations thereof.

13. The process of claim 1, wherein the beta-diketone is selected from C_5 to C_{30} beta-diketones.

14. The process of claim 1, wherein the beta-diketone is selected from C_5 to C_{20} beta-diketones.

15. The process of claim 1, wherein the beta-diketone is selected from C_5 to C_{10} beta-diketones.

16. The process of claim 1, wherein the beta-diketone is selected from acetylacetone, dibenzoylmethane, dipivaloylmethane, hexafluoroacetylacetone, or combinations thereof.

17. The process of claim 1, wherein the beta-diketone has a water content of less than 200 ppm by weight.

18. The process of claim 1, wherein the catalyst system comprises chromium, a heteroatomic ligand, and a metal alkyl compound.

19. The process of claim 17, wherein the heteroatomic ligand is selected from pyrrole compounds, diphosphinoaminyl compounds, N^2-phosphinylamidine compounds, N^2-phosphinylformamidine compounds, phosphinyl guanidine compounds, or combinations thereof.

20. The process of claim 1, wherein the catalyst system comprises:

a) a chromium compound, a pyrrole compound, a metal alkyl compound, and optionally, a halide containing compound;

b) a chromium compound, a diphosphinoaminyl compound, and a metal alkyl compound;

c) a chromium compound complexed to a diphosphinoaminyl compound, and a metal alkyl compound;

d) a chromium compound, an N^2-phosphinylamidine compound, and a metal alkyl compound;

e) a chromium compound complexed to an N^2-phosphinylamidine compound, and a metal alkyl compound;

f) a chromium compound, an N^2-phosphinylformamidine compound, and a metal alkyl compound;

g) a chromium compound complexed to an N^2-phosphinylformamidine compound, and a metal alkyl compound;

h) a chromium compound, an N^2-phosphinyl guanidine compound, and a metal alkyl compound;

i) a chromium compound complexed to an N^2-phosphinyl guanidine compound, and a metal alkyl compound; or

j) combinations thereof.

21. The process of claim 18, wherein the metal alkyl compound is selected from alkylaluminum compounds, aluminoxanes, or combinations thereof.

22. The process of claim 1, further comprising contacting the catalyst system in the reaction system effluent with i) a catalyst system deactivating and quench agent or ii) a catalyst system deactivating agent.

23. The process of claim 22, wherein the catalyst system deactivating and quench agent or catalyst system deactivating agent is selected from the group consisting of mono-alcohols, diols, polyols, and mixtures thereof.

24. The process of claim 22, wherein the beta-diketone is added to the chromium containing compound in the presence of the catalyst system deactivating and quench agent or catalyst system deactivating agent.

25. The process of claim 22, wherein the catalyst system deactivating and quench agent or catalyst system deactivating agent is selected from a C_4 to C_{12} mono-alcohol.

26. The process of claim 22, wherein the catalyst system deactivating and quench agent or catalyst system deactivating agent comprises 2-ethyl-1-hexanol.

27. The process of claim 1, wherein the olefin comprises ethylene.

28. The process of claim 1, wherein the oligomerization product comprises 1-hexene, 1-octene, or combinations thereof.

29. The process of claim 1, wherein the beta-diketone is added to the chromium containing compound in an amount sufficient to render the chromium containing compound non-pyrophoric.