CLAIMS

1. A process, comprising:

introducing a plastic melt comprising a plastic component into a reactor via a nozzle coupled with the reactor;

introducing a catalyst into the reactor via a first conduit coupling the reactor with a riser or a regenerator;

introducing a co-injection particle into the reactor, the co-injection particle having an average diameter less than an average diameter of the catalyst;

pyrolyzing the plastic component to form a pyrolysis product;

removing the pyrolysis product and the co-injection particle from the reactor via a second conduit disposed in a top ½ height of the reactor;

removing the catalyst from the reactor via a third conduit disposed in a bottom ½ height of the reactor, wherein the catalyst removed from the reactor comprises ash; and

introducing the catalyst from the third conduit to a separator to form a catalyst-rich phase and an ash-rich phase in the separator.

2. The process of claim 1, wherein the third conduit is disposed at an angle of about 30° to about 90° relative to a side of the separator coupled with the third conduit.

3. The process of claim 2, further comprising introducing a gas to the third conduit.

4. The process of claim 2, wherein the separator has a temperature of about 700^{o} F to about 1,050^{o} F when introduced to the separator.

5. The process of claim 1, wherein the third conduit has an end disposed within the separator and the end comprises a plurality of outlets.

6. The process of claim 1, wherein the third conduit has an end disposed within the separator and the end has one outlet.

7. The process of claim 1, further comprising introducing a gas into the separator via a fourth conduit at a rate of about 0.3 ft/s to about 1.5 ft/s, wherein the gas has a temperature of about 150° F to about 1,050° F.

8. The process of claim 1, wherein introducing the catalyst from the third conduit to the separator comprises operating the separator at a pressure of about 25 psig to about 40 psig and a temperature of about 700° F to about 1,050° F.

9. The process of claim 1, further comprising introducing the catalyst-rich phase to the regenerator.

10. The process of claim 1, wherein the catalyst introduced into the reactor comprises a zeolite and sand and the catalyst introduced from the third conduit to the separator comprises the zeolite, the sand, and the ash.

11. The process of claim 10, wherein introducing the catalyst from the third conduit to the separator further forms a sand-rich phase in the separator, the process further comprising removing the sand-rich phase from the separator via a fourth conduit.

12. The process of claim 1, further comprising introducing the ash-rich phase to a second separator to form a second catalyst-rich phase and a second ash-rich phase.

13. The process of claim 1, further comprising sorting a bale comprising the plastic component into a plurality of portions, wherein at least one of the portions comprises the plastic component.

14. The process of claim 1, wherein the co-injection particle has an average diameter of about 75 microns to about 200 microns.

15. The process of claim 14, wherein the catalyst has an average diameter of about 500 microns to about 600 microns.

16. The process of claim 14, wherein the catalyst has an average diameter of about 500 microns to about 600 microns.

17. The process of claim 16, wherein the catalyst has a diameter distribution of about +/−200 microns of the average diameter of the catalyst.

18. The process of claim 1, wherein the co-injection particle is a metal oxide.

19. The process of claim 18, wherein the co-injection particle is calcium oxide.

20. The process of claim 1, wherein the co-injection particle is a metal carbonate.

21. The process of claim 20, wherein the co-injection particle is calcium carbonate.

22. The process of claim 1, further comprising introducing the pyrolysis product and the co-injection particle via the second conduit to a cyclone separator and separating the pyrolysis product from the co-injection particle in the cyclone separator.

23. The process of claim 1, wherein the plastic melt has a temperature of about 300° F to about 700° F when introduced into the reactor.

24. The process of claim 1, wherein the plastic melt comprises an organic compound.

25. The process of claim 1, further comprising introducing a gas into the separator at a rate of about 0.1 ft/s to about 1.5 ft/s, wherein the gas has a temperature of about 150° F to about 1,050° F.

26. The process of claim 25, wherein introducing the catalyst from the third conduit to the separator comprises operating the separator at a pressure of about 20 psig to about 50 psig and a temperature of about 700° F to about 1,050° F.