

CLAIMS

What is claimed is:

1. A continuous process for converting waste plastic into recycle for polypropylene polymerization comprising:
 - (a) selecting waste plastics containing polyethylene and/or polypropylene;
 - (b) passing the waste plastics from (a) through a pyrolysis reactor to thermally crack at least a portion of the polyolefin waste and produce a pyrolyzed effluent;
 - (c) separating the pyrolyzed effluent into offgas, a pyrolysis oil comprising a naphtha/diesel/heavy fraction, and char;
 - (d) passing the pyrolysis oil from (c) to a filtration/metal oxide treatment;
 - (e) recovering the treated pyrolysis oil and passing same to a refinery FCC unit;
 - (f) recovering a liquid petroleum C₃ olefin/paraffin mixture fraction from the FCC unit;
 - (g) separating the C₃ paraffin and C₃ olefin into different fractions; and
 - (h) passing the C₃ olefin to a propylene polymerization reactor.
2. The process of claim 1, further comprising passing the C₃ paraffin to a dehydrogenation unit to produce C₃ olefin and then passing the C₃ olefin to a propylene polymerization reactor.
3. The process of claim 1, wherein a gasoline and heavy fraction are recovered from the refinery FCC unit.
4. The process of claim 1, wherein polypropylene products are prepared from the polymerized propylene.

5. The process of claim 1, wherein the amount of gasoline produced by the FCC unit is increased with recycled pyrolysis oil.
6. The process of claim 1, wherein the waste plastics selected in (a) are from plastics classification group 2, 4, and/or 5.
7. The process of claim 1, wherein the filtration employs a filter having pores averaging 5 microns or less in diameter.
8. The process of claim 7, wherein the pores average less than 1 micron in diameter.
9. The process of claim 1, wherein the metal oxide treatment comprises a metal oxide selected from CaO, ZnO, MgO, NiO, MoO₃, alumina, silica, silica-alumina, clay or a mixture thereof.
10. The process of claim 1, wherein the metal oxide treatment occurs at a temperature above 200° F.
11. The process of claim 1, wherein the filtration/metal oxide treatment occurs in a refinery comprising the FCC unit.
12. The process of claim 1, wherein filtration occurs at a pyrolysis facility and the metal oxide treatment occurs at a refinery comprising the FCC unit.
13. The process of claim 1, wherein the content of heptane insolubles is reduced to less than 0.1 wt. % after the filtration treatment.

14. The process of claim 1, wherein the chloride content is reduced to less 5 ppm after the metal oxide treatment.
15. The process of claim 1, wherein the total metal impurity is less than 10 ppm after the metal oxide treatment.
16. The process of claim 1, wherein solid particulate and chloride reduction is achieved in the filtration/metal oxide treatment of (d), and S, diene, olefin, and N reduction is achieved by the refinery FCC unit.
17. The process of claim 1, wherein only the diesel and heavy fractions of the pyrolysis oil, or the heavy fraction of the pyrolysis oil is passed to a filtration and metal oxide treatment.
18. The process of claim 1, wherein the treated pyrolysis oil recovered in (e) is first passed to an FCC pretreatment unit, from which effluent is recovered, and which recovered effluent is passed to the refinery FCC unit.
19. The process of claim 18, wherein solid particulate and chloride reduction is achieved in the filtration/metal oxide treatment of (d), and S, diene, olefin, and N reduction is achieved by the refinery FCC feed pretreatment unit.
20. The process of claim 18, wherein only the diesel and heavy fractions of the pyrolysis oil, or the heavy fraction of the pyrolysis oil is passed to a filtration and metal oxide treatment.
21. A continuous process for converting waste plastic into recycle for polypropylene polymerization comprising:
- (a) selecting waste plastics containing polyethylene and/or polypropylene;

(b) passing the waste plastics from (a) through a pyrolysis reactor to thermally crack at least a portion of the polyolefin waste and produce a pyrolyzed effluent;

(c) separating the pyrolyzed effluent into offgas, a pyrolysis oil comprising a naphtha/diesel/heavy fraction, and char;

(d) passing the pyrolysis oil from (c) to a filtration/metal oxide treatment; and

(e) recovering the treated pyrolysis oil and forwarding same to a refinery for propylene polymerization.

22. The process of claim 21, wherein the filtration employs a filter having pores averaging 5 microns or less in diameter.

23. The process of claim 22, wherein the pores average less than 1 micron in diameter.

24. The process of claim 21, wherein the metal oxide treatment comprises a metal oxide selected from CaO, ZnO, MgO, alumina Silica or silica-alumina, or a mixture thereof.

25. The process of claim 21, wherein the metal oxide treatment occurs at a temperature above 200° F (93° C).

26. The process of claim 21, wherein the content of heptane insolubles is reduced to less than 0.1 wt. % after the filtration treatment.

27. The process of claim 21, wherein the chloride content is reduced to less 5 ppm after the metal oxide treatment.

28. The process of claim 21, wherein the total metal impurity is less than 10 ppm after the metal oxide treatment.

29. The process of claim 21, wherein filtration occurs at a pyrolysis facility and the metal oxide treatment occurs at a refinery comprising the FCC unit

30. The process of claim 21, wherein the waste plastics selected in (a) are from plastics classification group 2, 4, and/or 5.

31. The process of claim 21, further comprising producing sustainable fuel products in the refinery and blending the products to produce gasoline, jet and/or diesel products.

32. The process of claim 31, wherein a jet fuel product is blended.