CLAIMS

What is claimed is:

1. A method of processing waste plastic, said method comprising:

(a) separating mixed plastic waste (MPW) into a polyethylene terephthalate-enriched (PET-enriched) stream and a polyolefin-enriched (PO-enriched) stream;

(b) subjecting at least a portion of said PET-enriched stream to solvolysis in a solvolysis facility; and

(c) subjecting at least a portion of said PO-enriched stream to at least one of (i) partial oxidation (POX) gasification facility; (ii) pyrolysis in a pyrolysis facility; and (iii) chemical conversion in an energy generation facility.

~~2. The method of claim 1, wherein the combined amount of PET and PO in said MPW is at least 5 and not more than 95 weight percent, based on the total weight of said MPW.~~

~~3~~2. The method of claim 1, wherein said PO-enriched stream comprises not more than 40 weight percent of polyethylene terephthalate, based on the total weight of the stream and wherein said PET-enriched stream comprises not more than 40 weight percent of polyolefin, based on the total weight of the stream.

~~4~~3. The method of claim 1, wherein said PET-enriched stream comprises at least 0.1 and not more than 10 weight percent (on a dry basis) of halogens, based on the total weight of said stream.

~~5~~4. The method of claim 1, further comprising combining said PO-enriched stream with another stream to provide a combined stream and introducing the combined stream into one of (i) through (iii).

~~6. The method of claim 5, wherein said another stream comprises a solvolysis coproduct stream.~~

~~7~~5. The method of claim ~~6~~4, wherein said another stream comprises a solvolysis coproduct stream, and said solvolysis coproduct stream is formed by subjecting at least a portion of said PET-enriched stream to solvolysis in a solvolysis facility.

~~8. The method of claim 6, wherein said solvolysis coproduct stream is a methanolysis coproduct stream.~~

~~9~~6. The method of claim ~~5~~4, wherein said another stream originates from at least one of said pyrolysis facility, a solidification facility, or a cracking facility.

~~10~~7. The method of claim 1, wherein at least a portion of said PO-enriched stream is introduced into said POX gasification facility.

~~11. The method of claim 10, wherein said POX facility includes a liquid-fed gasifier.~~

~~12. The method of claim 10, wherein said POX facility includes a solids-fed gasifier.~~

~~13. The method of claim 10, wherein said PO-enriched stream subjected to (i), (ii), or (iii) in step (c) is in the form of a slurry.~~

~~14. The method of claim 1, wherein said PO-enriched stream subjected to (i), (ii), or (iii) in step (c) is in the form of a melt.~~

~~15~~8. The method of claim 1, wherein step (c) includes subjecting at least a portion of said PO-enriched stream to two or more of (i) through (iii).

~~16~~9. The method of claim 1, wherein said MPW comprises PVC in an amount of at least 0.001 and/or not more than 5 weight percent, based on the

total weight of said MPW, wherein said MPW comprises at least 0.1 and/or not more than 25 weight percent of non-plastic solids, based on the total weight of said MPW, wherein said MPW comprises at least 5 weight percent PET, based on the total weight of said MPW, and at least 5 weight percent PO, based on the total weight of said MPW.

~~17~~10. A method of processing waste plastic, said method comprising:

(a) separating mixed plastic waste (MPW) into a polyethylene terephthalate-enriched (PET-enriched) stream and a polyolefin-enriched (PO-enriched) stream;

(b) subjecting at least a portion of said PO-enriched steam to at least one of (i) a partial oxidation (POX) gasification facility; (ii) pyrolysis in a pyrolysis facility; and (iii) chemical conversion in an energy generation facility,

wherein said PO-enriched stream comprises at least 50 weight percent polyolefin (PO) and has one or more of the following characteristics (i) through (vii) –

(i) an ash content of not more than about 5 weight percent;

(ii) a halogen content of not more than 250 ppm by weight (on a dry basis);

(iii) not more than 5 weight percent of nitrogen-containing compounds;

(iv) not more than 10 weight percent of polyethylene terephthalate;

(v) a mercury content of not more than 1 ppm;

(vi) an arsenic content of not more than 100 ppm; and

(vii) a melt viscosity of less than 25,000 poise measured at 10 rad/s and 250°C.

~~18. The method of claim 17, wherein said MPW comprises post-consumer plastic materials.~~

~~19. The method of claim 17, wherein said MPW comprises post-industrial plastic materials.~~

~~20~~11. The method of claim ~~17~~10, wherein said MPW comprises at least 0.1 and/or not more than 25 weight percent of non-plastic solids, based on the total weight of said MPW.

~~21. The method of claim 17, said PO-enriched stream has a melt viscosity of at least 1 poise and/or not more than 25,000 poise.~~

~~22~~12. The method of claim ~~17~~10, wherein said PO-enriched stream comprises two of said characteristics (i) through (vii).

~~23~~13. The method of claim ~~17~~10, further comprising subjecting at least a portion of said PET-enriched stream to solvolysis in a solvolysis facility; withdrawing at least one coproduct stream from said solvolysis facility; and introducing at least a portion of said coproduct stream to said pyrolysis facility, said POX facility, said energy generation facility, a cracking facility, and/or a solidification facility.

~~24~~14. The method of claim ~~23~~13, further comprising combining at least a portion of said solvolysis coproduct stream with said PO-enriched stream and subjecting the combined stream to at least one of (i) through (iii).

~~25~~15. The method of claim ~~23~~13, wherein said solvolysis facility comprises a methanolysis facility.

~~26. The method of claim 17, further comprising combining said PO-enriched stream with another process stream to form a combined stream and subjecting said combined stream to at least one of (i) through (iii).~~

~~27~~16. A method of processing waste plastic, said method comprising:

introducing a feed stream comprising at least 50 weight percent polyolefin (PO) into at least one of (i) a partial oxidation (POX) gasification facility; (ii) a pyrolysis facility; and (iii) an energy generation facility, wherein at least a portion of said feed stream comprises plastic not classified as #3 through #7 plastics.

~~28~~17. The method of claim ~~27~~16, wherein said feed stream comprises at least 5 and not more than 95 weight percent of plastic not classified as #3 through #7.

~~29. The method of claim 27, wherein said feed stream is in the form of a slurry.~~

~~30. The method of claim 27, wherein said feed stream is in the form of a melt.~~

~~31~~18. The method of claim ~~27~~16, wherein said feed stream comprises not more than 25 weight percent of polyethylene terephthalate (PET), based on the total weight of the stream.

~~32~~19. The method of claim ~~27~~16, wherein said ~~PO-enriched~~ feed stream has an ash content of not more than 5 weight percent, a halogen content of not more than 250 ppm by weight (on a dry basis), an amount of nitrogen-containing compounds of not more than 5 weight percent, an amount of oxygenated compounds in an amount of not more than 5 weight percent, a mercury content of not more than 10 ppm, not more than 10 weight percent of polyethylene terephthalate, an arsenic content of not more than 100 ppm, and a melt viscosity of not more than 25,000 poise, measured using a Brookfield R/S rheometer with V80-40 vane spindle operating at a shear rate of 10 rad/s and a temperature of 250°C.

~~33~~20. The method of claim ~~27~~16, comprising introducing a feed stream comprising at least 50 weight percent polyolefin (PO) into said partial oxidation (POX) gasification facility.

~~34. The method of claim 33, wherein said POX gasification facility includes a liquid-fed gasifier.~~

~~35. The method of claim 33, wherein said POX gasification facility includes a solids-fed gasifier.~~

~~36. The method of any of claims 1-35, wherein said method is performed in a commercial-scale chemical recycling facility.~~