CLAIMS

What is claimed is:

1. A method for processing waste plastic, said method comprising introducing at least a portion of a light organics coproduct stream from a solvolysis facility into at least one of the following downstream chemical processing facilities: (i) a partial oxidation (POX) gasification facility; (ii) a pyrolysis facility; (iii) an energy recovery facility; or a (iv) a cracker facility.

2. The method of claim 1, further comprising prior to said introducing, combining at least a portion of said light organics coproduct stream with another stream to form a combined stream and introducing said combined stream into at least one of said downstream chemical processing facilities (i) through (iv), wherein said other stream comprises:
   a) another solvolysis coproduct stream withdrawn from said solvolysis facility, or
   b) waste plastic, or
   c) liquified plastic, or
   d) pyrolysis oil.

3. The method of claims 1, further comprising, prior to at least a portion of said introducing, subjecting a feed stream comprising waste plastic to solvolysis in said solvolysis facility to produce a principal glycol product stream, a principal terephthalyl product stream, and said light organics coproduct stream, wherein said light organics coproduct stream has an average boiling point lower than the boiling point of said principal glycol.

4. The method of claim 3, wherein said feed stream further comprises textiles or carpet in an amount in the range of from 0.1 to 25 weight percent, based on the total weight of the feed stream.

5. The method of claim 3, wherein said light organics coproduct stream comprises a principal solvent, at least one acetaldehyde, para-dioxane (p-dioxane), and at least one additional component selected from at least one additional component selected from the group consisting of tetrahydrofuran (THF), methyl acetate, silanes, 2,5-methyl dioxolane, 1,4-cyclohexanedimethanol, 2-ethyl-1-hexanol, 2,2,4,4,-tetramethyl-1,3-cyclobutanediol, 2,2,4-trimethyl-3-pentenal, 2,2,4-trimethyl-3-pentenol, 2,2,4-trimethylpentane, 2,4-dimethyl-3-pentanone (DIPK), isobutyl isobutyrate, methyl formate, n-butanol, acetic acid, dibutyl ether, heptane, dibutyl terephthalate, dimethyl phthalate, dimethyl 1,4-cyclohexanedicarboxylate, 2-methoxyethanol, 2-methyl-1,3-dioxolane, 1,1-dimethoxy-2-butene, 1,1-dimethoxyethane, 1,3-propanediol, 2,5-dimethyl-1,3,5-hexadiene, 2,5-dimethyl-2,4-hexadiene, alpha-methyl styrene, diethylene glycol methyl ether, diethylene glycol formal, dimethoxydimethyl silane, dimethyl ether, diisopropyl ketone, EG benzoate, hexamethylcyclotrisiloxane, hexamethyldisiloxane, methoxytrimethylsilane, methyl 4-ethylbenzoate, methyl caproate, methyl glycolate, methyl lactate, methyl laurate, methyl methoxyethyl terephthalic acid, methyl nonanoate, methyl oleate, methyl palmitate, methyl stearate, octamethylcyclotetrasiloxane, styrene, trimethylsilanol, 1,1-dimethyoxy-2-butene, 4-methyl morpholine, 1,3,3-trimethoxypropane, methyl myristate, dimethyl adipate, n-methyl-caprolactam, dimethyl azelate, neopentyl glycol, and combinations thereof.

6. The method of claim 3, wherein said light organics stream comprises at least one azeotrope with water, with said principal glycol in said principle glycol product stream, and/or with said principal solvent.

7. The method of claim 1, further comprising introducing a second solvolysis coproduct stream from said solvolysis facility into at least one of said POX gasification facility, said pyrolysis facility, said energy recovery facility, and said cracker facility.

8. The method of claim 7, further comprising introducing said second solvolysis coproduct stream from said solvolysis facility into a polymer melt tank along with a stream of waste plastic to form a melt tank vapor stream and a melted plastic stream and introducing at least a portion of at least one of said melt tank vapor stream and said melted plastic stream into one or more of said downstream chemical processing facilities.

9. A method for processing waste plastic, said method comprising:

(a) combining at least one solvolysis coproduct stream withdrawn from a solvolysis facility with a stream of waste plastic in a liquification tank;

(b) withdrawing at least a vapor stream and a liquified stream from said liquification tank; and

(c) introducing at least a portion of said vapor stream and/or at least a portion of said liquified stream into at least one of the following: (i) a partial oxidation (POX) gasification facility; (ii) a pyrolysis facility; (iii) an energy recovery facility; or a (iv) a cracker facility.

10. The method of claim 9, wherein said stream of waste plastic includes at least 50 weight percent of polyolefin (PO), based on the total weight of the stream.

11. The method of claim 10, further comprising prior to introducing of step (c), passing at least a portion of said vapor stream through a scrubber to remove at least a portion of one or more components and

introducing the scrubbed vapor stream withdrawn from the scrubber into one or more of the downstream chemical processing facilities.

12. A method for processing waste plastic, said method comprising:

(a) combining at least one recycle content solvent stream with a waste plastic stream to form a combined stream;

(b) separating said combined stream to provide at least a vapor stream and a liquified stream; and

(c) introducing at least a portion of said vapor stream and/or at least a portion of said liquified stream into at least one of the following: (i) a partial oxidation (POX) gasification facility; (ii) a pyrolysis facility; (iii) an energy recovery facility; or a (v) a cracker facility.

13. The method of claim 12, wherein at least a portion of said combining is carried out in a liquification tank.

14. The method of claim 12, wherein said recycle content solvent stream comprises a solvolysis coproduct stream or a pyrolysis oil stream.

15. The method of claim 12, wherein said waste plastic stream comprises at least 50 weight percent polyolefin, based on the total weight of the stream.

16. A light organic solvolysis coproduct composition formed within a solvolysis facility for processing polyester terephthalate-containing waste plastic to form a principal glycol product and a principal terephthalyl product using a solvent, said composition comprising:

said principal solvent;

acetaldehyde;

para-dioxane (p-dioxane); and

at least one additional component selected from the group consisting of silanes, 2,5-methyl dioxolane, 2-ethyl-1-hexanol, 2,2,4,4,-tetramethyl-1,3-cyclobutanediol, 2,2,4-trimethyl-3-pentenal,

2,2,4-trimethyl-3-pentenol, 2,2,4-trimethylpentane, 2,4-dimethyl-3-pentanone (DIPK), isobutyl isobutyrate, methyl formate, n-butanol, dibutyl ether, heptane, dibutyl terephthalate, dimethyl 1,4-cyclohexanedicarboxylate, 1,1-dimethoxy-2-butene, 1,3-propanediol, 2,5-dimethyl-1,3,5-hexadiene, 2,5-dimethyl-2,4-hexadiene, alpha-methyl styrene, diethylene glycol formal, dimethoxydimethyl silane, dimethyl ether, diisopropyl ketone, hexamethylcyclotrisiloxane, hexamethyldisiloxane, methoxytrimethylsilane, methyl 4-ethylbenzoate, methyl caproate, methyl lactate, methyl laurate, methyl methoxyethyl terephthalic acid, methyl nonanoate, methyl oleate, methyl palmitate, methyl stearate, octamethylcyclotetrasiloxane, styrene, trimethylsilanol, 1,1-dimethyoxy-2-butene, 4-methyl morpholine, 1,3,3-trimethoxypropane, methyl myristate, dimethyl adipate, n-methyl-caprolactam, dimethyl azelate, neopentyl glycol, and combinations thereof.

17. The composition of claim 16, wherein said at least one additional component is selected from the group consisting of 2,2,4,4,-tetramethyl-1,3-cyclobutanediol, 2,2,4-trimethyl-3-pentenal, 2,2,4-trimethyl-3-pentenol, 2,2,4-trimethylpentane, 2,4-dimethyl-3-pentanone (DIPK), isobutyl isobutyrate, dimethoxydimethyl silane, methoxytrimethylsilane, methyl nonanoate, methyl oleate, methyl stearate, and combinations thereof.

18. The composition of claim 16, wherein said at least one additional component is selected from the group consisting of 1,1-dimethyoxy-2-butene, 4-methyl morpholine, 1,3,3-trimethoxypropane, methyl myristate, dimethyl adipate, n-methyl-caprolactam, dimethyl azelate, neopentyl glycol, and combinations thereof.

19. The composition any claim 16, further comprising at least one azeotrope with water, said principal solvent, and/or said principal glycol.

20. The composition any claim 16, wherein said light organics coproduct stream further comprises water in an amount of at least 2 weight percent, wherein said principal glycol is present in an amount of at least 2 weight percent, wherein said p-dioxane is present in an amount of 1 ppm to 50 weight percent, wherein said acetaldehyde is present in an amount of 1 ppm to 50 weight percent, all percentages based on the total weight of the stream, wherein said solvent comprises methanol, said glycol comprises ethylene glycol, and said terephthalyl comprises dimethyl terephthalate.