C L A I M S

1. A process for the recovery of aliphatic hydrocarbons from a liquid hydrocarbon feedstock stream (1) comprising aliphatic hydrocarbons, heteroatom containing organic compounds and optionally aromatic hydrocarbons, wherein the liquid hydrocarbon feedstock stream (1) comprises at least part of a hydrocarbon product formed in a process comprising cracking of waste plastics, wherein at least part of the plastics comprises heteroatom containing organic compounds, said process comprising the steps of:

a) contacting at least part of the liquid hydrocarbon feedstock stream (1) with a stream (2) comprising an extraction solvent a) which contains one or more heteroatoms, and subjecting the liquid hydrocarbon feedstock stream (1) to liquid-liquid extraction with the extraction solvent a), resulting in a first stream (5) or (5a) comprising aliphatic hydrocarbons and a second stream (6) comprising extraction solvent a), aliphatic hydrocarbons, heteroatom containing organic compounds and optionally aromatic hydrocarbons;

b1) mixing at least part of the second stream (6) resulting from step a) with a stream (14a) comprising a demixing solvent b) which contains one or more heteroatoms and has a miscibility in heptane which is lower than the miscibility of extraction solvent a) in heptane, and separating the resulting mixture into a first stream (15a) comprising aliphatic hydrocarbons and optionally aromatic hydrocarbons and a second stream (16a) comprising extraction solvent a), demixing solvent b), heteroatom containing organic compounds and optionally aromatic hydrocarbons;

b2) mixing at least part of the second stream (16a) resulting from step b1) with a stream (14b) comprising demixing solvent b) and separating the resulting mixture into

a first stream (15b) comprising heteroatom containing organic compounds and optionally aromatic hydrocarbons and a second stream (16b) comprising extraction solvent a) and demixing solvent b);

wherein steps b1) and b2) are sub-steps of a step b) which comprises two or more sub-steps;

c) separating at least part of the second stream (16b) resulting from step b2) into a first stream (8) comprising demixing solvent b) and a second stream (9) comprising extraction solvent a);

d) recycling at least part of the extraction solvent a) from the second stream (9) resulting from step c) to step a); and

e) optionally recycling at least part of the demixing solvent b) from the first stream (8) resulting from step c) to one or more of the sub-steps of step b).

2. The process according to claim 1, wherein step b) comprises of from 2 to 10, suitably of from 2 to 5, sub-steps.

3. The process according to claim 1 or claim 2, wherein step b) comprises:

bi) mixing at least part of the second stream (6) resulting from step a) with stream (14a) comprising demixing solvent b) and separating the resulting mixture into a first stream (15a) comprising aliphatic hydrocarbons and optionally aromatic hydrocarbons and a second stream comprising (16a) extraction solvent a), demixing solvent b), aliphatic hydrocarbons, heteroatom containing organic compounds and optionally aromatic hydrocarbons;

bii) mixing at least part of the second stream (16a) resulting from step bi) with stream (14b) comprising demixing

solvent b) and separating the resulting mixture into a first stream (15b) comprising aliphatic hydrocarbons, heteroatom containing organic compounds and optionally aromatic hydrocarbons and a second stream (16b) comprising extraction solvent a), demixing solvent b), heteroatom containing organic compounds and optionally aromatic hydrocarbons; and

biii) mixing at least part of the second stream (16b) resulting from step bii) with a stream (14c) comprising demixing solvent b) and separating the resulting mixture into a first stream (15c) comprising heteroatom containing organic compounds and optionally aromatic hydrocarbons and a second stream (16c) comprising extraction solvent a) and demixing solvent b); and

wherein step c) comprises separating at least part of the second stream (16c) resulting from step biii) into a first stream (8) comprising demixing solvent b) and a second stream (9) comprising extraction solvent a).

4. The process according to any one of claims 1 to 3, wherein the extraction solvent a) comprises ammonia or, preferably, one or more organic solvents selected from the group consisting of diols and triols, including monoethylene glycol (MEG), monopropylene glycol (MPG), any isomer of butanediol and glycerol; glycol ethers, including oligoethylene glycols, including diethylene glycol, triethylene glycol and tetraethylene glycol, and monoalkyl ethers thereof, including diethylene glycol ethyl ether; amides, including N-alkylpyrrolidone, wherein the alkyl group may contain 1 to 8 or 1 to 3 carbon atoms, including N-methylpyrrolidone (NMP), formamide and di- and monoalkyl formamides and acetamides, wherein the alkyl group may contain 1 to 8 or 1 to 3 carbon atoms, including dimethyl formamide (DMF), methyl formamide and dimethyl acetamide;

dialkylsulfoxide, wherein the alkyl group may contain 1 to 8 or 1 to 3 carbon atoms, including dimethylsulfoxide (DMSO); sulfones, including sulfolane; N-formyl morpholine (NFM); furan ring containing components and derivatives thereof, including furfural, 2-methyl-furan, furfuryl alcohol and tetrahydrofurfuryl alcohol; hydroxy esters, including lactates, including methyl and ethyl lactate; trialkyl phosphates, including triethyl phosphate; phenolic compounds, including phenol and guaiacol; benzyl alcoholic compounds, including benzyl alcohol; aminic compounds, including ethylenediamine, monoethanolamine, diethanolamine and triethanolamine; nitrile compounds, including acetonitrile and propionitrile; trioxane compounds, including 1,3,5-trioxane; carbonate compounds, including propylene carbonate and glycerol carbonate; and cycloalkanone compounds, including dihydrolevoglucosenone.

5. The process according to any one of claims 1 to 4, wherein the demixing solvent b) comprises one or more solvents selected from the group consisting of water and the solvents from the group of solvents as defined for extraction solvent a) in claim 4, and wherein the demixing solvent b) preferably comprises water.

6. The process according to any one of claims 1 to 5, wherein:

a stream (3) comprising a washing solvent c) is added to step a) resulting in a first stream (5) comprising aliphatic hydrocarbons and a second stream (6) comprising washing solvent c), extraction solvent a), heteroatom containing organic compounds and optionally aromatic hydrocarbons; or

the first stream resulting from step a), a stream (5a), comprises aliphatic hydrocarbons and extraction solvent a),

at least part of which first stream (5a) is contacted with a stream (3) comprising a washing solvent c) and is subjected to liquid-liquid extraction with the washing solvent c), resulting in a first stream (5b) comprising aliphatic hydrocarbons and a second stream (14) comprising washing solvent c) and extraction solvent a).

7. The process according to claim 6, wherein the washing solvent c) is identical to or different from, preferably identical to, demixing solvent b), and preferably comprises water.

8. A process for the recovery of aliphatic hydrocarbons from plastics, wherein at least part of the plastics comprises heteroatom containing organic compounds, said process comprising the steps of:

(I) cracking the plastics and recovering a hydrocarbon product comprising aliphatic hydrocarbons, heteroatom containing organic compounds and optionally aromatic hydrocarbons; and

(II) subjecting a liquid hydrocarbon feedstock stream (1), which comprises at least part of the hydrocarbon product obtained in step (I), to the process of any one of claims 1-7.

9. Process for steam cracking a hydrocarbon feed, comprising the steps of:

recovering aliphatic hydrocarbons from a liquid hydrocarbon feedstock stream (1) in a process according to any one of claims 1-8; and

steam cracking a hydrocarbon feed which comprises aliphatic hydrocarbons as recovered in the preceding step.