CLAIMS

1. A process for recovering a precious metal from a precious metal containing article or composition, the process comprising:

treating the precious metal containing article or composition with an oxidant composition under conditions to oxidise the precious metal in the precious metal containing article or composition to obtain a precious metal salt composition, wherein the precious metal is selected from the group consisting of gold, silver, ruthenium, rhodium, palladium, osmium, iridium, and platinum, wherein the oxidant composition comprises at least one halide ion source and at least one electrophilic halogen source;

contacting the precious metal salt composition with a sorbent under conditions to adsorb at least some of the precious metal salt to the sorbent to obtain a laden sorbent, wherein the sorbent is a polymeric polysulfide; and

recovering at least some of the precious metal from the laden sorbent.

2. The process according to claim 1, wherein the precious metal is gold.

3. The process according to claim 1, wherein the precious metal is silver.

~~4. The process according to any one of claims 1 to 3, wherein the oxidant composition comprises at least one halide ion source and at least one electrophilic halogen source.~~

~~5.~~4. The process according to any one of claims 1 to ~~4~~3, wherein the halide ion source comprises chloride ions.

~~6.~~5. The process according to claim ~~5~~4, wherein the halide ion source is selected from one or more of the group consisting of sodium chloride, potassium chloride, and hydrogen chloride.

~~7.~~6. The process according to any one of claims 1 to ~~4~~3, wherein the halide ion source comprises bromide ions.

~~8.~~7. The process according to claim ~~7~~6, wherein the halide ion source is selected from one or more of the group consisting of sodium bromide, potassium bromide, and hydrogen bromide.

~~9.~~8. The process according to any one of claims 1 to 3~~5~~, wherein the halide ion source comprises iodide ions.

~~10.~~9. The process according to claim ~~9~~8, wherein the halide ion source is selected from one or more of the group consisting of sodium iodide, potassium iodide, and hydrogen iodide.

~~11.~~10. The process according to any one of claims 1 to ~~10~~9, wherein the electrophilic halogen source is selected from one or more of the groups consisting of hypobromous acid, hypochlorous acid, hyprobromite salts, hypochlorite salts, bromochlorodimethylhydantoin (BCDMH), sodium dichloroisocyanurate (SDIC), dichloroisocyanuric acid, trichloroisocyanuric acid, sodium dibromoisocyanurate, dibromoisocyanuric acid, and tribromoisocyanuric acid.

~~12.~~11. The process according to any one of claims 4 to ~~11~~10, wherein the halide ion source is sodium bromide and the electrophilic halogen source is trichloroisocyanuric acid.

~~13.~~12. The process according to any one of claims 1 to ~~12~~11, wherein the ~~sorbent is a~~ polymeric polysulfide is formed by reacting a fatty acid composition comprising at least one unsaturated fatty acid or derivative thereof with sulfur, at a weight ratio between 9:1 and 1:9, under inverse vulcanisation conditions to produce a polymeric polysulfide wherein at least 50% of the fatty acids or derivatives thereof in the fatty acid composition are unsaturated.

~~14.~~13. The process according to claim ~~13~~12, wherein the fatty acid composition is a glyceride composition.

~~15.~~14. The process according to any one of claims 1 to ~~14~~13, wherein the process of recovering at least some of the precious metal from the laden sorbent comprises separating the laden sorbent from the precious metal salt composition.

~~16.~~15. The process according to any one of claims 1 to ~~15~~14, wherein the process of recovering at least some of the precious metal from the laden sorbent comprises reducing at least some of the precious metal salt adsorbed on the sorbent to form the precious metal.

~~17.~~16. The process according to claim ~~16~~15, wherein the process of recovering at least some of the precious metal from the laden sorbent comprises separating the precious metal from the sorbent.

~~18.~~17. The process according to claim ~~17~~16, wherein the process of separating the precious metal from the sorbent comprises degrading the sorbent.

~~19.~~18. The process according to claim ~~18~~17, wherein the process of degrading the sorbent comprises chemically degrading the sorbent.

~~20.~~19. The process according to any one of claims ~~18~~17 to ~~19~~18, wherein the process of degrading the sorbent comprises thermally degrading the sorbent.

~~21.~~20. The process according to claim ~~20~~19, further comprising scrubbing off-gases generated during thermal degradation of the sorbent polymer, wherein said scrubbing comprises passing the off-gases through a lime scrubber or through a solution of the oxidant composition.

~~22.~~21. The process according to any one of claims ~~19~~17 to ~~21~~20, wherein the process of degrading the sorbent comprises physically degrading the sorbent.

~~23.~~22. The process according to any one of claims 1 to ~~22~~21, wherein the precious metal containing article or composition further comprises mercury which is oxidised by the oxidant composition to form the precious

metal salt composition further comprising mercury salts, and the sorbent selectively removes the precious metal salts from the precious metal salt composition to provide a laden sorbent and a mercury salt laden leach solution.

~~24.~~23. The process according to claim ~~23~~22, further comprising removing mercury from the leach solution using a mercury sorbent.

~~25.~~24. The process according to claim ~~24~~23, wherein the mercury sorbent comprises a polysulfide polymer and/or activated carbon.

~~26. A sorbent having a precious metal salt adsorbed thereto formed by the process of any one of claims 1 to 22.~~

~~27. A precious metal recovered from a precious metal containing article or composition using the process of any one of claims 1 to 22.~~

~~28. A process for recovering a precious metal from a precious metal containing article or composition, the process comprising:~~

~~treating the precious metal containing article or composition with an oxidant composition comprising at least one halide ion source and at least one electrophilic halogen source under conditions to oxidise the precious metal in the precious metal containing article or composition to obtain a precious metal salt composition; and~~

~~recovering at least some of the precious metal from the precious metal salt composition.~~

~~29. The process according to claim 28, wherein the precious metal is gold.~~

~~30. The process according to claim 28, wherein the precious metal is silver.~~

~~31. The process according to any one of claims 28 to 30, wherein the halide ion source comprises chloride ions.~~

~~32. The process according to claim 31, wherein the halide ion source is selected from one or more of the group consisting of sodium chloride, potassium chloride, and hydrogen chloride.~~

~~33. The process according to any one of claims 28 to 30, wherein the halide ion source comprises bromide ions.~~

~~34. The process according to claim 33, wherein the halide ion source is selected from one or more of the group consisting of sodium bromide, potassium bromide, and hydrogen bromide.~~

~~35. The process according to any one of claims 28 to 30, wherein the halide ion source comprises iodide ions.~~

~~36. The process according to claim 35, wherein the halide ion source is selected from one or more of the group consisting of sodium iodide, potassium iodide, and hydrogen iodide.~~

~~37. The process according to any one of claims 28 to 36, wherein the electrophilic halogen source is selected from one or more of the groups consisting of hypobromous acid, hypochlorous acid, hyprobromite salts, hypochlorite salts, bromochlorodimethylhydantoin (BCDMH), sodium dichloroisocyanurate (SDIC), dichloroisocyanuric acid, trichloroisocyanuric acid, sodium dibromoisocyanurate, dibromoisocyanuric acid, and tribromoisocyanuric acid.~~

~~38. The process according to any one of claims 28 to 37, wherein the halide ion source is sodium bromide and the electrophilic halogen source is trichloroisocyanuric acid.~~

~~39. The process according to any one of claims 28 to 38, comprising filtering the precious metal salt composition.~~

~~40. The process according to any one of claims 28 to 39, comprising recovering the precious metal from the precious metal salt composition by chemical reduction, electrochemical reduction, chemical precipitation, and/or sorption onto a sorbent.~~

~~41. The process according to claim 40, wherein the chemical reduction comprises treating the precious metal salt composition with ascorbic acid or hydrogen gas under conditions to reduce and precipitate the precious metal.~~

~~42. The process according to claim 41, further comprising adding a copper binding ligand to the precious metal salt composition to bind any copper, if present, prior to treating the precious metal salt composition with ascorbic acid or hydrogen gas.~~

~~43. The process according to claim 42, wherein the copper binding ligand is selected from the group consisting of EDTA, copper binding water soluble amino acids and copper binding diamines.~~

~~44. The process according to claim 40, wherein the sorbent is a polymeric polysulfide formed by reacting a fatty acid composition comprising at least one unsaturated fatty acid or derivative thereof with sulfur, at a weight ratio between 9:1 and 1:9, under inverse vulcanisation conditions to produce a polymeric polysulfide wherein at least 50% of the fatty acids or derivatives thereof in the fatty acid composition are unsaturated.~~

~~45. The process according to claim 44, wherein the fatty acid composition is a glyceride composition.~~

~~46. The process according to any one of claims 28 to 45, wherein the precious metal containing article or composition further comprises mercury which is oxidised by the oxidant composition to form the precious metal salt composition further comprising mercury salts, the process further comprising selectively removing the precious metal salts from the precious metal salt composition using a sorbent to provide a laden sorbent and a mercury salt laden leach solution.~~

~~47. The process according to claim 46, further comprising removing mercury from the leach solution using a mercury sorbent.~~

~~48. The process according to claim 47, wherein the mercury sorbent comprises a polysulfide polymer and/or activated carbon.~~