CLAIMS

1. A method of recovering one or more target metal(s) from electronic waste, the method comprising:

(a) a pre-processing step comprising removing at least a portion of non-target material from the electronic waste or grinding to a preselected size particle, in which the pre-processing step comprises a base metal leach to remove one or more base metals, to give pre-processed electronic waste;

(b) a dissolving step comprising contacting the pre-processed electronic waste with a lixiviant such that at least a portion of the target metal(s) dissolve into the lixiviant to produce a pregnant solution;

(c) a biosorption step comprising contacting a microorganism with the pregnant solution such that at least a portion of the target metal(s) ions biosorb to the microorganism in which the microorganism becomes metal laden and the pregnant solution becomes barren;

(d) a separating step comprising substantially separating the metal laden microorganism from the barren solution; and

(e) a recovery step comprising recovery of the target metal(s) from the metal laden microorganism.

2. A method according to Claim 1, in which the target metal is gold.

3. A method according to Claim 1 or 2, in which electronic waste comprises less than 5% of the target metal.

4. A method according to Claim 1, 2 or 3, in which the pre-processing step comprises one or more unit operations selected from:

chip removal;

grinding to a preselected size;

removal of certain density fractions;

removal of magnetic material.

5. A method according to any preceding claim, in which the pre-processing step includes grinding and base metal leach.

6. A method according to any preceding claim, in which the base metal leach comprises treating the e-waste with a leaching agent comprising nitric acid, sulfuric acid, and/or hydrochloric acid.

7. A method according to any preceding claim, in which the target metal(s) and non-target materials are selectively dissolved by the lixiviant.

8. A method according to any preceding claim, in which the lixiviant solution is a thiourea-based aqueous solution, or a thiosulphate-based aqueous solution, or a thiocyanate-based aqueous solution, or a cyanide-based aqueous solution, or a halogen-based aqueous solution, or an aqua regia-based solution.

9. A method according to any preceding claim, in which the concentration factor of the target metal from the pregnant solution to the microorganism is greater than 5.

10. A method according to any preceding claim, in which the microorganism is a Gram-negative or Gram-positive bacteria.

11. A method according to any preceding claim, in which the non-target material includes one or more non-target metal(s) the microorganism selectively biosorbs the target metal(s) over the non-target metal(s) in the biosorption step and the non-target metal(s) remains in the barren solution in the separating step.

12. A method according to any preceding claim, in which the separation step includes at least one of:

gravity separation of the metal laden microorganism from the barren solution and removal of the barren solution;

centrifugation and removal of the barren solution;

filtration of the metal laden microorganism from the barren solution.

13. A method according to Claim 12, in which at least 60% of the barren solution is removed.

14. A method according to any preceding claim, in which the recovery step comprises contacting the metal laden microorganism with a condition which triggers the microorganism to substantially desorb the target metal(s) or burning or chemical dissolution of the metal laden microorganism to desorb the target metal(s).

15. A method according to any preceding claim, in which in which the method includes a filtering step following the dissolving step to remove at least a portion of undissolved non-target material from the pregnant solution.