CLAIMS:

1. An isolated genetically engineered bacterium, wherein the bacterium has been transformed by at least one polynucleotide molecule; the at least one polynucleotide molecule comprising a heterologous mercury(II) reductase (*MerA*) gene, operably linked to at least one promoter, and comprising at least one mutation which confers the gene product improved catalytic efficiency of reducing gold to elemental gold as gold nanoparticles, and/or ionic silver to elemental silver as silver nanoparticles when compared with wild type MerA, wherein the at least one mutation encodes amino acid substitutions at positions selected from the group comprising V317S, A323D, A323D (delΔ324-365), A414E, G415I, E416C, L417I, I418D and A422N of the wild type MerA.

2. The isolated bacterium of claim 1, wherein said at least one isolated bacterium comprises a G415I mutation which confers improved catalytic efficiency of reducing ionic gold to elemental gold as gold nanoparticles, ionic silver to elemental silver as silver nanoparticles, and reduced reductive capacity for mercury substrate when compared to a bacterium comprising a non-mutated *MerA* gene.

3. The isolated bacterium of any one of the previous claims, wherein the bacterium is selected from the group comprising *Chromobacterium violaceum*, *Pseudomonas fluorescens*, *P. aeruginosa* and *Eschericia coli* and/or wherein the bacterium is stable at pH 10.

4. A process for recovering elemental gold or silver, as gold nanoparticles from ionic gold (Au3+) or as silver nanoparticles from ionic silver (Ag+), respectively, said process comprising the steps of:

a) contacting the isolated genetically engineered bacterium according to any one of claims 1 to 3 with a leachate comprising ionic gold (Au3+) and/or ionic silver (Ag+); and

b) recovering the elemental gold and/or silver nanoparticles from the leachate.

5. The process according to claim 4, wherein the said contact is performed in alkaline conditions.

6. A method for producing an isolated genetically engineered bacterium, wherein the bacterium has been transformed by at least one polynucleotide molecule; the at least one polynucleotide molecule comprising a heterologous mercury(II) reductase (*MerA*) gene,

operably linked to at least one promoter, and comprising one or more mutations which confers the gene product improved catalytic efficiency of reducing ionic gold (Au^{3+}) to elemental gold as gold nanoparticles, and/or ionic silver (Ag^{+}) which is reduced to elemental silver as silver nanoparticles, when compared with wild type MerA, said method comprising the steps:

a) performing error-prone PCR on a gene encoding mercury(II) reductase (MerA);

i) transforming at least one bacterium with the products of said PCR;

ii) selecting transformants that grow on a media comprising Au^{3+} and/or Ag+; or

b) performing multiple site-saturated mutagenesis by overlap-extension PCR on a gene encoding mercury(II) reductase (MerA);

i) transforming at least one bacterium with the products of said PCR;

ii) selecting transformants that grow on a media comprising Au^{3+} and/or Ag^{+}.

7. The method of claim 6, wherein in part a) the PCR is performed with forward and reverse primers, wherein the forward primer comprises the nucleotide sequence set forth in SEQ ID NO: 1 and the reverse primer comprises the sequence set forth in SEQ ID NO: 2 and/or wherein in part b) the PCR is performed with primers containing NNK and/or MNN at the target sites V317, Y441 and C464, and/or

wherein said selection involves at least 2 forms of selection, wherein one form comprises selection on agar plates comprising Au^{3+} and/or Ag^{+} and another form comprises selection in liquid culture comprising Au^{3+} and/or Ag^{+}.