CLAIMS

1. A leaching composition for extracting cobalt from a waste material, wherein the composition comprises at least one chemically active organic lixiviant comprising at least one weakly acidic hydroxyl group, the organic lixiviant being effective to alter the oxidation state of cobalt in the waste material and generate a soluble cobalt (II) ionic species comprising an anion derived from the organic lixiviant.

2. A leaching composition according to claim 1 wherein at least one organic lixiviant comprises at least one abstractable proton.

3. A leaching composition according to claim 1 or claim 2 wherein at least one organic lixiviant is effective to oxidise Co metal to Co (II), optionally wherein the lixiviant is effective to reduce Co(III) to Co(II).

4. A leaching composition according to any one of claims 1 to 3 wherein the organic lixiviant comprises a hydrogen donor having the capacity to oxidise cobalt metal *in situ* and generate hydrogen gas.

5. A leaching composition according to any one of claims 1 to 4 wherein the or each acidic hydroxyl group has a pKa of ≥2, optionally wherein the or each acidic hydroxyl group has a pKa of from 2 to 13.

6. The leaching composition according to any one of Claims 1 to 5 wherein the organic lixiviant comprises a carboxylic acid, a non-carboxylic organic acid such as ascorbic acid, phenol or phenolic derivative or suitable combinations thereof.

7. The leaching composition according to Claim 6 wherein the organic lixiviant comprises at least a carboxylic acid, optionally wherein the carboxylic acid comprises a hydroxycarboxylic acid, further optionally wherein the hydroxycarboxylic acid comprises glycolic acid, lactic acid and/or citric acid.

8. The leaching composition according to Claim 7 wherein the leaching composition comprises at least one carboxylic acid and also a non-carboxylic organic acid, optionally wherein the non-carboxylic acid is ascorbic acid.

9. The leaching composition according to any Claim 7 or Claim 8 wherein the leaching composition comprises a phenolic derivative, optionally wherein the phenolic derivative is hydroquinone.

10. The leaching composition according to any one of Claims 1 to 9 wherein the organic lixiviant is provided in combination with at least one compatible oxidising and/or reducing agent (such as hydrogen peroxide) in the leaching composition, or one or more compatible adjuvant(s) or excipient(s).

11. A process for extracting cobalt from a waste material, comprising the step of subjecting the waste material to chemical leaching in the presence of a leaching composition according to any one of claims 1 to 10 to separate cobalt from the waste material.

12. The process according to Claim 11 wherein the waste material is a spent catalyst.

13. The process according to Claim 11 or Claim 12, wherein the process is carried out in a reactor.

14. The process according to any one of Claims 11 to 13, additionally comprising the preliminary step(s) of dewaxing, oxidising and/or reducing the waste material.

15. A process for selectively separating cobalt from a waste material in a reactor, wherein the waste material is a spent catalyst, comprising the steps of:
    a. de-waxing the catalyst;
    b. optionally oxidising the de-waxed catalyst;
    c. subjecting the optionally oxidised catalyst to chemical leaching in the presence of a leaching composition according to claims 1 to 10 to separate the cobalt from the catalyst substrate; and
    d. recovering the leached metal from the reactor.