Claims

1. A method of recovering titanium dioxide and aluminium sulphate from a particulate material, said method comprising:
    a. contacting the particulate material with sulphuric acid and heating to form a sulphated mixture;
    b. filtering the sulphated mixture to produce a filter cake and a first permeate comprising sulphuric acid;
    c. contacting the filter cake with water to form a sulphated suspension comprising titanyl sulphate;
    d. filtering the sulphated suspension to produce a permeate comprising at least titanyl sulphate, and a retentate comprising insoluble residue;
    e. contacting the permeate comprising at least titanyl sulphate with water to produce a hydrolysis liquor;
    f. hydrolysing the titanyl sulphate;
    g. separating titanium dioxide hydrate from the hydrolysis liquor to produce a permeate comprising aluminium sulphate, and a retentate comprising titanium dioxide hydrate; and
    h. precipitating aluminium sulphate from the permeate;

    wherein step h. may be carried out after step d or after step g.
2. The method of claim 1 wherein the retentate comprising insoluble residue comprises at least one product selected from calcium sulphate and silica.
3. The method of claim 1 or 2 wherein the precipitation of aluminium sulphate comprises the steps of:
    a. cooling the permeate from step d. or step g. to produce a cooled liquor comprising precipitated aluminium sulphate; and
    b. filtering the cooled liquor to produce a retentate comprising precipitated aluminium sulphate, and a permeate.
4. The method of any one of the preceding claims wherein the particulate material comprises greater than 8m% titanium dioxide and greater than 10m% aluminium oxide.
5. The method of claim 4 wherein the particulate material comprises greater than 15m% titanium dioxide and greater than 10m% aluminium oxide.
6. The method of any one of the preceding claims wherein the particulate material comprises a ratio of titanium dioxide to aluminium oxide (TiO_2:Al_2O_3) of approximately 0.2 to 2.6.
7. The method of any one of the preceding claims wherein the step of precipitating aluminium sulphate comprises cooling the permeate to between 10°C and 4°C.

8. The method of any one of the preceding claims wherein the particulate material is selected from the group consisting of iron slag, melter slag, obtained from iron slag, obtained from melter slag, obtained from an iron manufacturing process, and obtained from a steel manufacturing process.
9. The method of any one of the preceding claims wherein the method further comprises the step of grinding raw material to form the particulate material of step a.
10. The method of claim 9 wherein the particulate material has a particle size between 10 and 180μm.
11. The method of any one of the preceding claims wherein the particulate material is contacted with 4-10 times its stoichiometric quantity of sulphuric acid.
12. The method of any one of the preceding claims wherein the step of filtering the sulphated mixture further comprises contacting the mixture with compressed air.
13. The method of claim 12 wherein the temperature of the compressed air is from 10°C to 85°C.
14. The method of any one of the preceding claims wherein the permeate comprising at least titanyl sulphate is heated to remove water and increase the free acidity.
15. The method of any one of the preceding claims wherein the hydrolysis liquor is contacted with water containing titanium dioxide particles.