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METHODS FOR PURIFYING MANGANESE IN METAL STATE

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2 Claims. (Cl. 204—105)

As known, manganese ores are rarely found in pure state in nature and metallic manganese and particularly free from iron is not easily obtained directly from manganese ores.

This invention is directed to a method for purifying manganese and by means of the method of this invention iron and other impurities may be removed therefrom; in the method of this invention manganese and iron and other impurities contained in metallic manganese are converted into soluble salts by an attack by means of acid and subsequently iron and other impurities are precipitated by the addition of an oxidising agent followed by a neutralisation step; thereafter the precipitate containing the whole of iron and impurities present in the initial metal is separated by physical means and the solution of manganese salt is treated, preferably by electrolysis, to obtain pure manganese.

The electrolysis step is effected with advantage in a suitable manner to obtain and hold the anolyte and catholyte separate from each other for their re-use in the process.

Manganese dioxide is preferably used as oxidising agent for precipitating iron, and for such a purpose manganese dioxide obtained in said electrolysis step is used with advantage because it is in pure state and does not introduce foreign substances in the solution.

An embodiment of the method of this invention is hereinafter described by way of example.

Metallic manganese which is impure mainly because of a content of iron therein, is treated with sulphuric acid or sodium bisulphate; thus a solution is obtained which consists of manganese sulphate and ferrous sulphate.

An oxidising agent is added to said solution, preferably manganese dioxide (MnO_2) and thus iron present in the solution is converted into ferric state ($Fe_2(SO_4)_3$) manganese being converted to the state of manganous salt ($MnSO_4$).

Subsequently the solution is neutralised by an addition of a neutralizing agent as calcium carbonate or ammonia in gas or solution, in presence of ammonia salts; iron is thus precipitated as ferric hydrate. The neutralisation step may be effected with advantage by using as neutralising agent the catholyte obtained from the subsequent electrolysis step.

Then the precipitate is separated, this operation being effected physically by means of a decanter and a vacuum filter; thus a solution of $MnSO_4$ free of impurities is obtained which is subsequently treated for deposition of manganese by an electrolysis step in presence of ammonium salts.

Manganese in the state of pure metal is thus obtained while the anolyte, catholyte and manganese dioxide are carried back into the process again; the anolyte recovered from electrolysis step may be used for the initial acid attack of the metal manganese and the catholyte may be used in the neutralizing step while the manganese dioxide is utilized in the oxidising step effected before the neutralisation one.

By way of example to recover one kilogramme of manganese from a certain weight of manganese with an impurity content due to the presence of iron, silicon and other impurities therein, said metal manganese is comminuted and subsequently it is leached with dilute sulphuric acid (having a content of about 20% of sulphuric acid) to obtain manganese sulphate; to the solution of manganese sulphate an excess of manganese dioxide and then about 5 kilogrammes of ammonium sulphate and ammonia are added to secure the neutralisation of the acid liquor. Iron and other impurities are thus precipitated, including silicon which is partly oxidised and partly removed in the state of silicic anhydride during the attack step.

The precipitate is separated and the pure solution thus obtained is electrolysed with cathodes made of aluminium or of stainless steel and with lead anodes, use being made of partitions of porous porcelain or bags of glass filaments and fabric and asbestos sheets to recover the anolyte and catholyte separately. Thereafter the manganese cathodes thus obtained are removed from the cathodes of the electrolysis cell pure manganese dioxide being obtained on the lead anodes for re-use in the process.

The solution of metal manganese may if desired be effected by means of other mineral acids such as hydrochloric acid; the corresponding salts of manganese and iron are thus obtained and iron is subsequently precipitated by an oxidation step and thereafter the process is prosecuted in the above described manner.

What I claim as my invention and desire to secure by United States Letters Patent is:

1. A method for separating manganese from its ores having a content of impurities including iron, consisting in dissolving said manganese by an acid to bring it in solution, adding as an oxidising agent manganese dioxide to said solution, neutralising said solution by the addition of an alkaline agent to cause the precipitation of said impurities therefrom and electrolysing said

solution to obtain manganese in pure state at the cathode and manganese dioxide at the anode, said electrolysis step being carried out by means of porous separating partitions and the anolyte and catholyte obtained in said electrolysis step being held separate from each other returned for their re-use in the process and introducing said catholyte in said neutralizing step, said anolyte, in said dissolving step and the manganese dioxide formed at the anode in the oxidizing step.

2. A method for separating manganese from its ores having a content of impurities including iron, consisting in dissolving said manganese by an acid to bring it in solution, adding an oxidising agent to said solution, neutralizing said solution by the addition of an alkaline agent to cause the precipitation of said impurities therefrom, electrolysing said solution to obtain manganese in pure state, said electrolysis step being carried out by means of porous separating partitions and the anolyte and catholyte obtained in said electrolysis step being held separate from each other, and introducing said catholyte in said solution neutralising step and said anolyte in the said dissolution step.

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