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ELECTRODE CLEANING PROCESS

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This invention relates to a process of cleaning the surface of lead or lead alloy electrodes by the use of soluble sulphides.

In carrying out this invention sulphides or their solutions are applied to the surface of lead or lead alloy electrodes to soften or loosen any oxide coating, precipitate, or scale so that such coating, precipitate, or scale may be easily removed as by mechanically brushing the surfaces of the electrodes or flushing them with water. In this way clean electrode surfaces are produced so that the maximum efficiency in the use of power for electrolysis and in the production of chemical changes in the electrolyte can be maintained.

When a scale is formed upon the surface of an anode or when an insulating film of gas is held between a scale upon the surface of the anode and the anode itself there will be a corresponding resistance to the passage of the electric current to the electrolyte, thus causing higher power consumption per unit of metal deposited. In order to obtain maximum efficiency in the production of chemical and electro-chemical reactions in the electrolyte and the economical use of power it is therefore very desirable that the anode surfaces be kept clean.

Heretofore lead or lead alloy electrodes used in electrolysis have been cleaned by beating or scraping the surfaces to remove the coating of oxide, scale and any other precipitate or deposit adhering to the electrodes. This is costly in labor and sometimes damages the electrodes. Also, irregular patches of non-conducting scale or the like are often left which cause correspondingly higher current densities on the clean areas from which it is difficult to absorb the gas as rapidly as it is evolved during the electrolytic process. The high current density on the clean areas results in higher voltage drop in the passage of the electric current to the electrolyte and therefore higher power consumption per unit of copper deposited.

Another objection which results because of higher current density areas on the anode is the deposition of rough copper opposite them on the cathode. Rough copper exposes more surface to attack by ferric sulphate present in the electrolyte, thus causing some of the deposited copper to be converted into copper sulphate. The presence of this ferric sulphate at the cathode causes counter-electromotive force opposing the passage of the current through the electrolyte, thus resulting in higher power consumption.

The present invention is especially useful for cleaning the lead and lead alloy electrodes that are used in the well-known electrolytic process for recovering copper from ores. In this process of recovering copper from ores, ore containing cuprous sulphide, Cu_2S, is crushed and treated with a solution of sulphuric acid and ferric sulphate to dissolve the cuprous sulphide. The presence of other substances, such as copper sulphate, ferrous sulphate and aluminum sulphate promotes various desirable chemical or electro-chemical reactions or more economical operation of the electrolytic process. When the cuprous sulphide or chalcocite is dissolved from the ore ferric sulphate is converted into ferrous sulphate, thus:

$$Cu_2S+2Fe_2(SO_4)_3=2CuSO_4+4FeSO_4+S$$

During the electrolytic recovery of the copper the following reactions probably take place as copper is deposited on the cathode and ferrous sulphate is converted into ferric sulphate:

$$CuSO_4+H_2O=Cu+H_2SO_4+O$$

$$CuSO_4+2FeSO_4=Cu+Fe_2(SO_4)_3$$

$$H_2SO_4+O+2FeSO_4=Fe_2(SO_4)_3+H_2O$$

The free oxygen is evolved at the anode and ferrous sulphate should be in contact with the anode to absorb the oxygen while it is still in the nascent state. If a nonconducting coating of scale or precipitate is on the anode, the oxygen will be evolved on the inner side of this coating out of intimate contact with the ferrous sulphate of the electrolyte. This oxygen would then change into the inactive form before reacting with the ferrous sulphate and would bubble up through the solution or would combine with lead of the anode to form more scale which would be lead oxide PbO_2. Another reason why a clean anode is