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ANODE

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1 Claim. (Cl. 204-293)

This invention relates to anodes adapted particularly for use in the electrowinning of manganese.

In this art lead anodes have been used but their use is attended with the great disadvantage that large quantities of manganese dioxide are formed at the anode. Fink and Kolodney U. S. Patent 2,320,773, June 1, 1943, have disclosed that by using alloys, the constituents of which comprise lead, tin, and antimony, or lead, tin, antimony and cobalt (or lead, tin, antimony, cobalt and silver), that the formation of manganese dioxide can be repressed. This is due to the formation of a coating which catalyzes the formation of oxygen and minimizes the formation of manganese dioxide. The use of such compositions constitutes a distinct improvement in the art. However, suppression of manganese dioxide formation is not the only property which is desirable in an anode. It is desirable that the anode have a long life and be substantially insoluble. An anode which operates satisfactorily only for a short time represents an economic loss.

It is an object of this invention to devise a stable anode which has a long life and substantially complete insolubility in addition to the property of suppressing manganese dioxide formation.

It has been discovered that the cause of deterioration is loss of certain constituents, more particularly cobalt and tin, this loss signifying the functioning of the anode, to the extent of the loss, as a soluble anode. It has been further discovered that the loss of these constituents by solution in the electrolyte seriously impairs not only the structure of the anode but also the functioning of the catalytic coating thereon. In the use of anodes containing lead, tin, antimony and cobalt, an adherent film or coating forms on the anode surface, this coating being a complex of certain oxides including the oxides of lead, tin, cobalt and antimony. This coating performs a valuable catalytic function in accelerating oxygen evolution and minimizing manganese dioxide formation. The desirable properties of the anode depend at least to a large extent upon maintenance of this coating without rupture. When during use there is a loss of tin or cobalt this coating is disturbed or ruptured and its catalytic activity in suppressing manganese dioxide formation greatly impaired.

It has been further discovered that stability of the anode depends upon the use of an anode containing certain maximum critical percentages of cobalt and tin. If the proportions of these elements materially exceed these critical values, instability upon electrolysis results, accompanied by impairment of the anode structure as well as impairment of the desired functioning of the catalytic coating. For tin the maximum is about 25

percent; for cobalt it is about 0.04 percent. The cobalt may range from about 0.04 percent to about 0.02 percent and the tin from about 25 percent to about 20 percent. The chief function of the antimony is to act as a strengthening component and the range of the proportion of antimony may be from a maximum of about 6 percent to a minimum of about 4 percent. The balance of the composition is for the most part lead, although small amounts of elements normally associated with lead are not precluded, as for example silver.

This invention, therefore, involves the discovery that by limiting the maximum proportion of tin and cobalt, loss of those components during electrolysis is prevented, impairment of the structure and functioning of the anode and its catalytic coating is prevented and a stable anode obtained.

In accordance with the present invention, therefore, an anode is made which as manufactured has a composition or analysis as follows:

	Percent by weight
Cobalt	0.02- 0.04
Tin	20 -25
Antimony	4 - 6
Balance	Principally lead

In view of the tendency of cobalt to oxidize, care should be taken to avoid the formation of oxides thereof. It will be found that an anode of this composition is stable and not only has this composition as manufactured but also substantially maintains the above composition during use. Such an anode has been found to have a life greatly exceeding that of an anode having proportions of cobalt, tin and antimony substantially exceeding the critical values above set forth. It will also be found that this stable anode upon use develops a coating which is an oxide complex containing the oxides of lead, manganese, antimony, tin and cobalt and that the integrity of this coating is substantially maintained throughout the life of the anode.

The anode may be in various forms including, without limiting the generality thereof, a solid plate or sheet, a perforated sheet, a grid, bars suspended from a horizontal support, and a coating or cladding on a core of other conductive material.

What is claimed is:

An anode for manganese electrowinning having the following composition:

	Percent by weight
Cobalt	0.02 to 0.04
Tin	20 to 25
Antimony	4 to 6
Balance	Principally lead

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