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(54) **METHOD AND APPARATUS FOR ELECTROWINNING COPPER USING THE FERROUS/FERRIC ANODE REACTION AND A FLOW-THROUGH ANODE**

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See application file for complete search history.

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(57) **ABSTRACT**

The present invention relates, generally, to a method and apparatus for electrowinning metals, and more particularly to a method and apparatus for copper electrowinning using the ferrous/ferric anode reaction and a flow-through anode, such as, for example, a dimensionally stable carbon, carbon composite, metal-graphite, or stainless steel anode. In general, the use of a flow-through anode—coupled with an effective electrolyte circulation system—enables the efficient and cost-effective operation of a copper electrowinning system employing the ferrous/ferric anode reaction at a total cell voltage of less than about 1.5 V and at current densities of greater than about 26 Amps per square foot (about 280 A/m2), and reduces acid mist generation. Furthermore, the use of such a system permits the use of low ferrous iron concentrations and optimized electrolyte flow rates as compared to prior art systems while producing high quality, commercially saleable product (i.e., LME Grade A copper cathode or equivalent), which is advantageous.

2 Claims, 3 Drawing Sheets