

Synthesizing New Anodes From Qatalum's 1st Cut SPL

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Abstract

Aluminum industry produces hundreds of tons of spent pot lining (SPL) waste every year. SPL is classified into two types: 1st cut and 2nd cut. The 1st cut SPL which is the material under study in this work is mainly composed of graphite (~ 60%), ceramic material and Al metal (~ 10%). On contrary with the 2nd Cut SPL, there is a consensus that the 1st cut SPL is a hazardous material and must be treated before dumping it in a landfill. Recycling it will be more beneficial if possible. The aim of this study is using the extracted graphite material from the 1st Cut SPL to produce new carbonaceous anodes for the Al molten electrolytic cells. The idea is to mix the extracted graphitic material with new binder materials e.g. o-phenylenediamine (C₆H₄(NH₂)₂), polyaniline or phosphorous (also a mixture of two or all of them) to increase the thermal and chemical stability and electrical conductivity of these new anodes compared to the currently used anodes in Qatalum (Qatalum uses 70% petroleum coke + 30% Coal Tar Pitch (CTP) as a binder). This might result in extending the life time of the carbon anodes and decrease the number of carbon dioxide kilograms that are released per a ton of produced Al metal. For comparison, the anodes were synthesized using the extracted graphite material from the 1st cut SPL, a commercial one and a petroleum coke (PC). The thermal properties were characterized using thermal gravimetric analysis. Also, the electrical conductivity of the new produced anodes was measured. In addition, the impedance spectra for the new anodes were measured at different temperatures and compared to the currently used anodes at Qatalum. Results have shown that anodes prepared from 50% of the extracted graphite with 10% of the commercial graphite and 40% coal tar pitch have impedance of one order of magnitude lower than the currently used anodes in Qatalum.