In Situ Investigation of Current Distribution in the Anode

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Abstract

During the last few decades, there have been several improvements to the Hall-Héroult process to reduce the energy consumption. One of the modifications was the reduction of the anode-to-cathode distance (ACD), which increases the sensitivity of the cell. However, this can cause operational problems due to large variations of the current distribution in the electrolytic bath. To maintain operational stability while minimizing the ACD, a better understanding of the current distribution in the electrolytic bath is required. Considering the aggressive environment, an *in situ* current distribution in the bath remains difficult to obtain. In this paper, a new approach is proposed to allow correlations between the current distribution variations in a specific anode block and the change of surrounding *in situ* pot operational conditions such as alumina dissolution, bubble movement, metal pad deformation, etc. Since the current distribution on a specific horizontal plane in the anode block is linked to the evolution of the electrical resistance between the anode bottom and the cathode, the proposed approach could provide an efficient way to identify design and/or operational problems and take appropriate action.

Keywords: Current distribution in anode block; anode electrical resistance; in situ anode current distribution; in situ pot operational conditions.