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聚铝沟排布对导流型铝电解槽热应力分布的影响

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摘 要: 为了优化导流型铝电解槽聚铝沟设计方案, 对槽内热应力分布特征进行研究分析。采用商用有限元计算软件ANSYS针对两种聚铝沟设计方案(即方案 I 为工字型聚铝沟结构; 方案 II 为单聚铝沟结构)的导流槽模型进行了电-热-应力耦合计算, 同时针对热应力引起的槽体形变进行模拟。结果表明: 采用方案 I 工字型聚铝沟结构时, 槽体内部热应力较大, 尤其是两端靠近横向聚铝沟的阴极炭块内部具有较大的应力集中, 而采用方案 II 单聚铝沟结构时, 该处的应力集中得到了较好的缓和, 槽体形变较小。

关键字: 导流型铝电解槽; 热应力; 形变; 有限元方法

Influences of various aluminum accumulation sump designs on thermal stress distribution in drained aluminum reduction cell

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Abstract: In order to optimize the aluminum accumulation sump designs, the characteristics of thermo-stress distribution in the drained style aluminum reduction cells were studied. The electric-thermo-mechanical coupled simulations of two types of drained aluminum reduction cells, i.e. scenario I is with central sump and two accessorial sumps at the ends of the cell; scenario II is with only a central sump at the cell bottom, were conducted on the commercial finite element method software package ANSYS. The results show that, for scenario I, a relatively large thermal stress intensity exists in the carbon cathode, especially for the carbon blocks at the two ends of the cell. For scenario II, the aforementioned thermal stress

intensity is relieved remarkably, and the deformation is relatively small.

Key words: drained style aluminum reduction cell; thermal stress; deformation; finite element method

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