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Investigation of MHD Processes in Aluminium Reduction Cells

Ivan D. Borisov, Sergey A. Poslavskiy, **Yuriy I. Rudnev**

Kharkov National University, Kharkov, Ukraine

The MHD-processes in high-power industrial aluminium reduction cells are investigated. The effective numerical methods for the electric and magnetic fields for the steady flows of the molten aluminium and electrolyte as well as for determing steady metal-electrolyte interface shapes are developed. The two-parameter differential turbulence models in calculations for steady flows are used. The small oscillations of the melt in the vicinity the equilibrium state are studied. The numerical methods for obtaining values of electric current corresponding to regime of wave generation on the metal-electrolyte interface and the anode-cathode distance are developed. The mathematical models of nonlinear oscillations of the melt have been elaborated and calculations methods for obtaining frequencies and values of periodic oscillation amplitudes in overcritical domain depending on constructive parameters of reduction cells are proposed. The experimental investigation of MHD-processes occurring in physical models have been carried out.

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