APPLICATION OF FLOW-THROUGH THREE-DIMENSIONAL ELECTRODES FOR REGENERATION OF PLATING IRON ELECTROLYTES: 1. MATHEMATICAL MODEL

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Abstract. The mathematical model of electrochemical processes distribution within the three-dimensional flow-through electrode for the system Fe(III)/Fe(II)/Fe is described in this paper, considering also the electrochemical reactions of hydrogen and molecular oxygen reduction. Possible dynamic changes in the parameters of electrode, electrolyte and the process are taken into account in the mathematical model, such as electro-conductivity of electrode material, electrolyte flow rate, material porosity and specific electrode surface, concentrations of electro-active substances and other characteristics within the local volume of electrode. Electrode and process characteristics are treated as time and coordinate functions within the electrode volume. The results of calculations and experimental studies of iron electro-reduction are given, the analysis of the numerical modeling is provided.

Keywords: electro-reduction, three-dimensional flow-through electrodes, electro-active components, numerical calculations of electrolysis processes.