The novel hydroelectrometallurgical technology of simultaneous production of metallic manganese, electrolytic manganese dioxide and manganese sulfate monohydrate

G Tsurtsumia, D Shengelia, N Koiava, T Lezhava, D Gogoli, L Beriaishvili and S Suladze
Ivane Javakhishvili Tbilisi State University, Georgia

The novel hydroelectrometallurgical technology is developed to simultaneously produce electrolytic metallic manganese, electrolytic γ-MnO₂ and MnSO₄ ∙H₂O in one technological cycle. The united, complex technological scheme consists of two technological lines. One of these lines is designed for: By sulfuric acid leaching of MnO containing primary products formed by high thermal reduction of manganese oxide ores; Purification from Fe³⁺, Ni²⁺, Co²⁺ and other heavy metals cations by hydrolysis (pH 4) and adding Na₂S into the MnSO₄ solution; Crystallization of MnSO₄ ∙H₂O after treatment of concentrated MnSO₄ solution in autoclave under high temperature condition; Supply of hot, autoclave outlet solution of MnSO₄ to anodic area (anodic area is separated by anionic membrane to prevent flow of NH₄⁺ into anolyte) where γ-MnO₂ is deposited on the anode. The second technological line is designed for: Purification of solution prepared from MnSO₄∙H₂O produced in the autoclave and technical (NH₄)₂SO₄ by (NH₄)₂S and supply of purified solution to the cathodic area of the same reactor where metallic Mn is deposited on the cathode. In accordance with presented technological scheme, optimal technological parameters are determined for MnSO₄ ∙H₂O and 50-55 g∙l⁻¹ Mn²⁺ containing solutions obtained by autoclave treatment of concentrated clean solution of MnSO₄ (115 g∙l⁻¹ Mn²⁺) produced after processing of manganese oxide ore. The technological novelty also is exploitation of heat pump to maintain 35-380C in catholyte and 92-940C in anolyte in an electrochemical reactor working under 20A load and divided by anionic membrane (AMI 7001S). As a cooling agent of heat pump, R-600a (isobutane) was chosen. The evaporator of the heat pump was immersed into the catholyte and the condenser - into the anolyte. The effectiveness of heat pump was also determined.

Recent Publications:


Biography

Gigla Tsurtsumia got his PhD from Karpov Physico-Chemical Institute in 1977, Moscow, Russia. His interest is related to electrochemical technology of production of manganese and its compounds, electrodeposition of alloy coatings and fuel cells. He published more than 40 papers and got 6 patents.