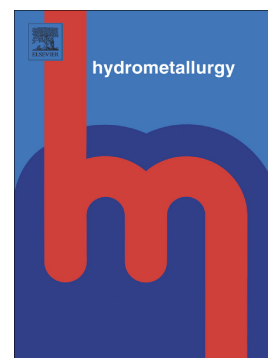


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Cleaner Production of Vanadium Oxides by Cation-Exchange Membrane-Assisted Electrolysis of Sodium Vanadate Solution

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Abstract: We herein report the development of a membrane-assisted electrochemical method for separating sodium and vanadium from a sodium orthovanadate solution. During the employed electrolysis process, Na^+ ions in the anode chamber pass through the cation-exchange membrane and combine with OH^- ions in the cathode chamber to produce a concentrated NaOH solution, resulting in lowering of the pH in the anode chamber from 13.7 to 1.81. This reaction results in the precipitation of 92.60%-pure vanadium oxide. The effects of the electrolysis time, current density, solution temperature, and initial NaOH concentration in the cathode chamber on the process were investigated. It was found that increases in the current density and solution temperature decreased the initial NaOH concentration in the cathode chamber and enhanced sodium and vanadium separation. Using a current density of 600 A/m^2 and a solution temperature of 338 K, 3641 kW·h of energy was consumed to produce 1 t of NaOH and 0.75 t of V_2O_5 over an electrolysis time of 7 h.

Keywords: cation-exchange membrane electrolysis; sodium vanadium separation; vanadium oxide; NaOH recovery

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