



O31. Prospects of iron electrowinning from an iron-rich industrial residue

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The development of energy-efficient, carbon-free, and environmentally friendly routes to produce iron and steel is critical. Direct electrochemical reduction of iron oxides has been gaining attention as a process allowing in-situ reductions at the cathode, under strong alkaline media with hydrogen and oxygen as by-products. This technology also considers the integration of renewable energies and reduces 87% of the direct CO₂ emissions [1–2]. In this scope, the present work consists of the novel electrochemical reduction of akaganeite (β -FeOOH) particle suspension into iron, under a strongly alkaline solution at low temperature, to study the prospects of using a metallurgical waste as an iron oxide source in comparison with the synthetic composition. The by-product of nickel manufacture is also studied in the frame of this work. The synthetic β -FeOOH and the industrial residue depositions were performed in 10 M of NaOH as electrolyte at moderate temperatures of 90 °C. The deposition was performed in both galvanostatic and potentiostatic conditions. This allowed optimizing the microstructural composition of the iron. The selected experimental conditions allow efficient deposition of the iron without significant evolution of hydrogen, allowing an efficiency increase in comparison to the deposition from dissolved iron salts or conventional acidic suspensions. Cyclic-voltammetry was used to characterize the deposits from the electrochemical point of view. Combined studies of XRD/SEM/EDS proved the presence of Fe crystals with this electrochemical system. Certain differences in iron microstructure were found. It is shown that relatively high efficiencies can be achieved in both synthetic akaganeite and industrial sludge.

References

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