Sulphate Ions Removal from an Abandoned Mine Water using Electrocoagulation. Characterization of the Flocs Originated through Chemical and Morphological Analysis

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doi: 10.20964/2019.07.60

Received: 13 March 2019 / Accepted: 5 May 2019 / Published: 10 June 2019

This paper shows a study on the removal of sulphate ions from the abandoned mine drainage by applying the electrocoagulation process. The aluminum plates were used as a sacrificial electrode in a filter-type reactor on different volumetric flows between 0.1 and 0.4 L min⁻¹, and the current densities of 4, 5, 6 and 7 mA/cm². 60 L of water were used, extracted from the “El Nopal” mine, which is located in the city of Guanajuato, Mexico ([SO₄⁻²] = 6704 mg L⁻¹, pH=8.2, conductivity= 3.72 mS cm⁻¹), collected during the January - July 2018 period. The concentration of sulphate ions decreased from 6704 mg L⁻¹ to 1871 mg L⁻¹ (obtaining 72% of removal), using a current density of 4 mA cm⁻² and a linear velocity of 2.95 cm s⁻¹. After that, to the residues generated by the electrocoagulation process (flocs) we performed the analyses of SEM-EDS, XRD, Infrared Spectroscopy and Magnetic Resonance with the purpose to learn about their chemical composition, crystalline structure and functional groups present in the flocs, respectively, indicating that in the said composition there were found chemical elements like O, Na, Mg, Al, Si, S, Cl, K and Ca.

Keywords: Sulphate removal, Abandoned mine water, Electrocoagulation, Flocs, Aluminum sacrificial anode.

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