Int. J. Electrochem. Sci., 12 **(2017)** 1774 – 1784

International Journal of
ELECTROCHEMICAL
SCIENCE
www.electrochemsci.org

An Electrochemical Study of Pyrite Oxidation in 0.1 M Sulfuric Acid at High Temperature and High Pressure

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doi: 10.20964/2017.03.68

Received: 1 November 2016 / *Accepted:* 23 January 2017 / *Published:* 12 February 2017

Open circuit potential, potentiodynamic polarization plots and electrochemical impedance spectroscopy for pyrite in 0.1 M sulfuric acid in the temperature range of 200 to 350 °C and pressure range of 25 to 40 MPa were measured, with the aid of a self-designed electrochemical measurement set-up which can operate at high temperature and high pressure. Results show that increased temperatures benefit the oxidation of pyrite: at 40 MPa, when the temperature was rised from 200 to 350 °C, corrosion potential (E_{corr}) decreased from -199.83 to -778.78 mV, corrosion current density (i_{corr}) increased from 4.33 to 22.16 mA/cm^2, polarization resistance (R_p) decreases from 34.11 to 3.85 Ω·cm^2, resistance of the passive layer (R_{pl}) decreased from 42.16 to 2.48 Ω·cm^2. Effects of pressure were also considered, at 300 °C, when pressure was increased from 25 to 40 MPa, E_{corr} decreased from -621.48 to -713.25 mV, however, i_{corr} and R_p rarely changed.

Keywords: Pyrite; acid pressure oxidation; open circuit potential; potentiodynamic polarization; electrochemical impedance spectroscopy

FULL TEXT