Electrochemical Analysis of Galena Reactivity in Typical Physicochemical Conditions of Calcareous Soils

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A proposal methodology using electrochemical techniques and carbon paste electrodes (CPE) were applied to evaluate the oxidation mechanisms of galena and identify secondary species on its surface, in a medium that simulates typical physicochemical environment of the calcareous soils. This study was conducted at the larger interval of potentials, carried out beyond that data reported in the literature. The secondary species were observed with scanning electron microscopy technique. The results showed that with the proposed methodology was possible evaluate to quickly the oxidation mechanisms of galena due to instantaneous formation of secondary phases on the galena mineral surface and a simulated medium. Galena (PbS) mineral is initially oxidized to sulfide intermediate species deficient in metal, followed by formation of a passive film of anglesite (PbSO₄). The subsequent formation of cerussite (PbCO₃) was carried out mainly by precipitation mechanism; meanwhile an electrochemical oxidation to cerussite occurs when the passive film of anglesite is dissolved from the galena surface. Finally, the formation of compact elongated structures with nanotubes shape was observed (likely phases of PbO₂) to more positive potentials ($E_{\lambda+} \geq 1.8$ V).

Keywords: Galena mineral, electrochemical oxidation, calcareous soils, anglesite, cerussite.

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