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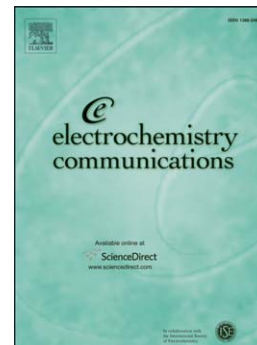
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Paint Casting: A facile method of studying mineral electrochemistry

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Abstract

The electrochemical properties of minerals are often difficult to study due to the need to maintain an electrical contact with the current collector. In this study it is shown that a paste of the powdered mineral can easily be made by mixing it with an ionic liquid and painting this onto an electrode surface. This enables voltammograms with high resolution and relatively low resistive artefacts to be obtained. The oxidative and reductive charge can be correlated to the loading of mineral on the electrode.

Key Words

Mineral; galena; deep eutectic solvent; electrodisolution

1. Introduction

The issue with studying the electrochemistry of solid, conducting materials is maintaining electrical conductivity with the charge collector and the electrolyte. This study could refer to almost any conducting material but for the purpose of this article the mineral galena (PbS) was used as a test substrate.

One method to study the electrochemistry of minerals is to have a single crystal contacted to an electrode using a conducting silver epoxy. The issue with this is that some minerals are poorly conducting and so there is usually a resistive artefact which decreases the resolution of the voltammogram to such an extent that very broad waves are usually obtained.

An alternative approach which has been used is to make a composite mixture of powdered mineral, with an inert conducting material such as graphite and an inert fluid such as a silicone oil. The components are usually ground into a paste which can be pressed into an electrode. These are laborious to make and can also lead to resistive artefacts. Practical issues usually limit the current collector to carbon [1]. A review of electrochemical analysis of solids has been carried out by Grygar et al. [2] and a database of the electrochemical properties of minerals and artists' pigments has also been collated [3].

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