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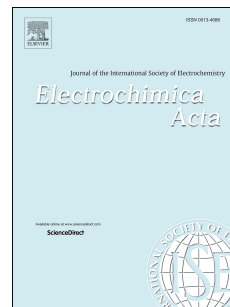
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Immersion and electrochemical deposition of Ru on Si

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Ruthenium, Silicon, Immersion deposition, Electrochemical deposition, UV-vis spectroscopy

Abstract

The stability of the aquapentachlororuthenate (III) complex has been monitored in ultrapure water, hydrochloric acid, and sulphuric acid using UV-vis spectroscopy. When a Si – H terminated surface is exposed to an acidic solution containing Ru^{3+} , metallic Ru nuclei are deposited and the surface is oxidized due to hole injection by Ru^{3+} into the valence band of silicon. The self-limiting mechanism was investigated by electrochemical methods (voltammetry and open-circuit potential transients). For the electrochemical deposition of Ru on n-Si(100), the nuclei size and density were determined using atomic force microscopy. The impact of applied current density was studied, for which it was found that hydrogen evolution strongly reduces the nuclei density. The Ru|Si interface has been characterized using transmission electron microscopy and elemental mapping. It was observed that hemispherical nuclei are deposited on an interfacial silicon oxide layer.

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