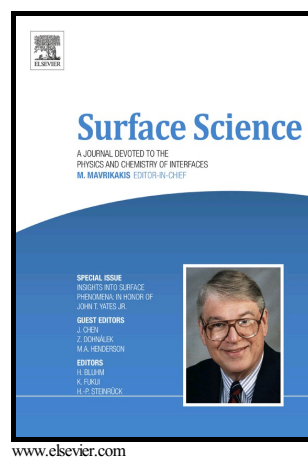


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Nonlinear electronic transport and enhanced catalytic behavior caused by native oxides on Cu nanowires

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Abstract

Electrical transport properties of individual nanowires (both in axial and transversal directions) and their random networks suggest rapid oxidation when Cu is exposed to ambient conditions. The oxidation process is elucidated by thorough XRD, XPS and Raman analyzes conducted for a period of 30 days. Based on the obtained experimental data, we may conclude that first, cuprous oxide and copper hydroxide form that finally transform to cupric oxide. In electrical applications, oxidation of copper is not a true problem as long as thin films or bulk metal is concerned. However, as highlighted in our work, this is not the case for nanowires, since the oxidized surface plays quite important role in the contact formation and also in the conduction of percolated nanowire networks. On the other hand, by taking advantage of the mixed surface oxide states present on the nanowires along with their large specific surface area, we tested and found excellent catalytic activity of the oxidized nanowires in phenol oxidation, which suggests further applications of these materials in catalysis.

Keywords

Cu nanowires; oxidation; electrical transport; surface oxide; catalytic activity

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