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Microstructural and electrical properties of Al/n-type Si Schottky diodes with Au-CuPc nanocomposite films as interlayer

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Abstract

Au-CuPc nanocomposite films were prepared by simultaneous evaporation of Au and CuPc with various Au and CuPc concentrations. Microstructural analysis of Au-CuPc films revealed elongated Au cluster formation from isolated Au nanoclusters with increasing Au concentration associated with coalescence of Au clusters. Au-CuPc films with different compositions were employed as interlayer in Al/n-Si Schottky diode. Barrier height and series resistance of the Al/n-Si Schottky diode with Au-CuPc interlayer decreased with increasing Au concentration. This could be associated with the enhancement of electron tunneling between neighboring clusters due to decrease in spacing of Au clusters and formation of conducting paths through the composite material. Interface state density of the Al/n-Si Schottky diode with Au-CuPc interlayer increased with increasing Au concentration. This might be because the inclusion of metal decreases the crystallinity and crystal size of the polymer matrix accompanied by the formation of local defect sites at the places of metal nucleation.

Keywords: Nanocomposite, Au-CuPc, Schottky contact, barrier height, interface state density, optical band gap

¹P.R. Sekhar Reddy and V. Janardhanam contributed equally to this work.

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