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Charge Transport Properties of Continuous and Nanostructured Ruthenium Thin Films MICHAEL STEEVES, DERYA DENIZ, ROBERT LAD, University of Maine, UNIVERSITY OF MAINE TEAM — Ru is a p-type transition metal with a 0^oC resistivity of 6.8 $\mu\Omega$ cm and Hall coefficient of +22 x 10^{-5} cm^3/C for large grained polycrystalline bulk samples. However, the resistivity and carrier mobility of Ru thin film samples have not been investigated in detail. We have studied the charge transport behavior of continuous polycrystalline Ru thin films and nanorod structured Ru films grown on amorphous silica. Polycrystalline films (200nm thick) were deposited by normal-incidence RF magnetron sputtering of a Ru target in an Ar plasma. Films consisting of highly oriented ∼20 nm wide and ∼60 nm high nanorods were grown by 80 $^\circ$ glancing angle deposition using DC magnetron sputtering. Van der Pauw resistivity and Hall coefficient measurements were acquired from 20-300^{o}C to contrast the transport properties of the continuous and nanorod structures. It was found that film resistivities decreased by as much as 50 % upon first heating due to defect annealing, and the resistivities of the annealed films were significantly higher than the reported bulk value. The resistivities of nanorod-structured films were an order of magnitude higher than the continuous films. Hall coefficients were positive for both film types, indicating holes as majority carriers, but were lower than the bulk value suggesting that both resistivity and hole mobility are a strong function of nanostructure.

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