Low Temperature Crystallization of Metastable Nickel Manganite Spinel Thin Films

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Abstract: Single-phase metastable cubic spinel nickel manganite films, 0.5 = Mn/(Mn+Ni) = 0.8, were produced using chemical solution deposition. Of these, the sample with Mn/(Mn+Ni) = 0.80 showed the lowest electrical resistivity. Films annealed in Argon at 400 degrees C for 5 h exhibit temperature coefficient of resistance values ranging from -3.81 to -3.93%/K and electrical resistivities of 10 kO-cm. It was found by transmission electron microscopy that the metastable spinel phase appeared in both pyrolyzed and post-deposition annealed films. Spectroscopic ellipsometry measurements over the spectral range from 0.75 to 6.0 eV showed that the complex dielectric function spectra (e = e1 + ie2) varied as a function of the annealing conditions, due at least in part to changes in film density. Aging experiments have been used to identify variations in resistivity and temperature coefficient of resistance as functions of time to assess material stability. As a result, the aging coefficient was 6.5% for a film with Mn/(Ni+Mn) = 0.80 after aging at 150 degrees C for 500 h.

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