

Spin Spray-Deposited Nickel Manganite Thermistor Films for Microbolometer Applications

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Source: Journal of the American Ceramic Society **Volume:** 94 **Issue:** 2 **Pages:** 516-523 **DOI:** 10.1111/j.1551-2916.2010.04097.x **Published:** February 2011

Abstract: Nickel manganite thin films are good candidates for thermal imaging applications because of their large temperature coefficient of resistance (TCR), ($> -3\%/K$) and good environmental stability. To enable low-temperature deposition (90 degrees C) on preexisting circuitry, a spin spray technique was developed for these materials. As-deposited manganese oxide films show well-developed X-ray diffraction patterns, while as-deposited nickel manganite films exhibit a nanocrystalline spinel structure. Low-temperature (400 degrees C) postdeposition annealing leads to densification of the nanocrystalline nickel manganite spinel films. Spectroscopic ellipsometry measurements on annealed films provide complex dielectric function spectra over a range from 0.75 to 5.15 eV with comparable features with those found in films prepared by a chemical solution method. Energy-dispersive X-ray spectroscopy indicates that the final composition of the films is Ni deficient relative to the starting solution composition. The TCR of the nickel manganite films annealed at 400 degrees C in an argon atmosphere is $-3.6\%/K$. Doping the nickel manganite films with zinc results in an improvement of crystallinity, but leads to substantial increases in the electrical resistivity. Copper doping reduces the resistivity of the films to < 1.0 k center dot cm without degrading the crystalline quality, thus resulting in films suitable for microbolometer applications.

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