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Investigation of the working pressure effect on NdNiO3 thin films deposited by reactive magnetron co-sputtering followed by a soft annealing process.

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In a previous work[1] we have clearly shown the possibility to synthesize $NdNiO_3$ thermochromic perovskite by using reactive magnetron co-sputtering followed by soft annealing in air at 650°C. This annealing condition is much less drastic than those reported in the literature where a high oxygen pressure and/or epitaxial stabilisation are usually necessary to stabilize the Ni^{3+} cations. This result allows to find new substrates suitable for the thermochromic coatings improving the applications. In this study, different working pressures and target current have been used in order to refine the synthesis parameters of the perovskite phase under soft annealing conditions. The partial pressures of gases affect the energy of the sputtered species when they are ejected and condensed on the substrate. Interactions between coating and the reactive plasma are also suspected.
The Nd and Ni contents were adjusted by controlling precisely the current applied to the two targets. The films were deposited at various working pressures: 0.5, 4 and 7 Pa. XRD was performed before and after annealing to determine the crystalline phases present inside the coating. The chemical composition of as-deposited and annealed films was estimated by electron probe microanalyses. SIMS analyses were performed to check the composition along the film depth before and after annealing. The film morphology was studied by SEM. The DC electrical resistance and the thermochromics properties were measured, respectively, by using the four-probe method scanning temperature and Fourier Transform Infrared spectroscopy from -196°C to 25°C.

[1] F. Capon, D. Horwat, J.F. Pierson, M. Zaghrioui, and P. Laffez, J. Phys. D, App. Phys., 42, 182006 (4pp), 2009.

Keywords
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