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Deposition of reduced ceria thin films by reactive magnetron sputtering for the development of a resistive gas sensor — •Paul-G. Nitsch[1], Markus Ratzke[1], Emilia Pozarowska[2], Jan I. Flege[2], Carlos Alvarado Chavarin[3], Christian Wenger[3], and Inga A. Fischer[1] — [1]Experimentalphysik und funktionale Materialien, BTU-CS, Cottbus, Germany — [2]Angewandte Physik und Halbleiterspektroskopie, BTU-CS, Cottbus, Germany — [3]IHP - Leibniz-Institut für innovative Mikroelektronik, Frankfurt (Oder), Germany

The use of cerium oxide for hydrogen sensing is limited by the low electrical conductivity of layers deposited from a ceria target. To increase the electrical conductivity, partially reduced cerium oxide layers were obtained from a metallic cerium target by reactive magnetron sputtering. The proportions of the oxidation states Ce3+, present in reduced species, and Ce4+, present in fully oxidized species, were determined by ex-situ XPS. For electrical characterization, films were deposited on planarized tungsten finger electrodes. IV curves were measured over several days to investigate possible influences of oxygen and humidity on electrical conductivity. The morphological stability of the layers under ambient conditions was investigated by microscopical methods. The XPS results show a significant amount of Ce3+ in the layers. The electrical conductivity of as-grown samples is several orders of magnitude higher than that of samples grown from a ceria target. However, the conductivity decreases over time, indicating an oxidation of the layers. The surface morphology of the samples was found to be changing drastically within days, leading to partial delamination.

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