

Experimental Investigations on Humidity-Sensing Behaviour of Neodymium Oxide

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In this paper, we report the humidity-sensing behaviour of neodymium oxide (99% pure, Johnson & Matthey, London). It was characterized by scanning electron microscopy (SEM), X-ray diffraction (XRD) and by measuring the mass loss. From SEM, the average particle size is 60–90 nm and particles have a random pore size. XRD reveals that at room temperature the sensing material is $\text{Nd}(\text{OH})_3$ and is crystalline in nature. When neodymium oxide was annealed at 200°C and at higher temperatures, it became Nd_2O_3 . The particle size calculated from Scherrer's formula varies from 100 to 110 nm. A pellet of this material was made using a hydraulic pressing machine (M.B. Instruments, New Delhi) for use as a sensing element after thermal annealing at temperatures of 200, 400, 600 and 800°C. After each step of annealing, the sensing element was placed in a specially designed conductivity holder and exposed to humidity inside a chamber with controlled humidity. Variations in resistance due to the adsorption of water vapour through the sensing element were observed. The sensitivity of the sensing element, the repeatability and the effect of temperature on morphology and sensing characteristics were studied.

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