FTIR INVESTIGATION OF THE CO_2 SENSING MECHANISM OF A $BaTiO_3$/CuO NANOCOMPOSITE

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The response of an electronic conductance sensor toward gases is due to the variation of the free carrier concentration induced by changes in the sensor environment. This mechanism, which essentially develops at the interface, reflects the adaptability of the semiconductor surface to the modifications of the surrounding gaseous milieu. From a chemical point of view, these surface changes correspond to adsorption/desorption processes and, therefore, are controlled by the chemical composition of the sensor surface. Hence the first steps toward the improvement of the sensor characteristics (sensitivity, response time, drift ...) are dependent on the comprehension of the chemical phenomena occurring at the gas-sensor interface. Both surface chemical composition and surface reactivity must be controlled to fabricate reproducible sensors. Obviously, this is particularly critical for nanomaterials because the increase of the specific surface area and of the grain boundary volume implies an increase of the contaminant concentration at the surface, possibly leading to adverse effects. Conversely, a significant increase of the sensitivity can be expected from nanomaterials-based sensors.

Fourier transform infrared (FTIR) spectrometry which is a particularly performant tool for the surface analysis of nanosized materials, is applied to the surface study of a $BaTiO_3$/CuO nanocomposite powder. This nanocomposite has been successfully used to fabricate electronic conductance sensors for CO_2 detection. The chemical composition and the surface reactivity of the composite nanopowder are discussed before studying the interaction of CO_2 with the sensor simulated by a pressed pellet of nanopowder. Both the formation of new surface species and the variation of the pellet electrical conductivity upon CO_2 adsorption are simultaneously monitored *in situ* by FTIR spectrometry. Then, the correlation between electrical conductivity changes and surface chemical modifications are discussed. A tentative model qualitatively describing the reaction mechanism will be given.

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