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Air Moisture Sensing Properties of $ZnCr_2O_4$--K_2CrO_4 Composites

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Abstract: Crystalline structure, surface morphology and the response to air moisture of ceramic system of composition $ZnCr_2O_4$ - K_rCrO_4 formed by solid state reaction at elevated temperatures were investigated. The fired ceramic body, which proved to be mainly constructed from about 1 μ m sized $ZnCr_2O_4$ spinel grains, was found to be porous. The humidity sensing behaviour of the sensors reveals that the electrical conduction is protonic and is controlled through the thin layers of water adsorbed on the surface of the grains, with charge transfer to the electrodes. Only the material containing 20% K_2CrO_4 in $ZnCr_2O_4$ exhibited an exponential behaviour to humidity, which shows about three orders change in the dc resistance over the relative humidity (RH) range between 25 and 90%. Based on ac impedance measurements, an equivalent circuit associated with a network of RC parallel circuit in series with constant phase elements (CPEs) has been suggested. It can be therefore assumed that such equivalent circuit model of the sensor under moderate moist condition indicates the charge transport processes mediated by proton hopping and diffusion.

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