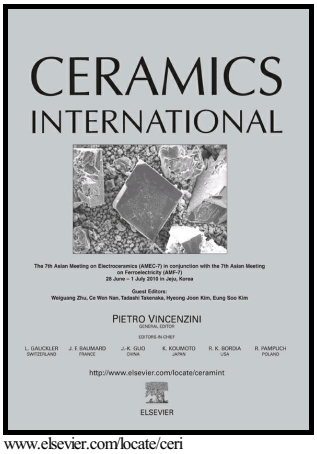

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Zinc modified cadmium titanite nanoparticles: electrical and room temperature methanol sensing properties

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Abstract

In this work $Zn_xCd_{1-x}TiO_3$ (x=0.25, 0.5, 0.75) nanoparticles were synthesized using solid state reaction method. Detailed investigation of electrical properties and room temperature methanol sensing characteristics of synthesized nanoparticles was carried out. X-ray diffraction (XRD) and Scanning Electron Microcopy (SEM) were used to determine the crystal structure and morphology of the prepared material. The transition from positive temperature coefficient of resistivity (PTCR) to negative temperature coefficient of resistivity (NTCR) was observed in $Zn_{0.75}Cd_{0.25}TiO_3$, $Zn_{0.50}Cd_{0.50}TiO_3$ and $Zn_{0.25}Cd_{0.75}TiO_3$ nanoparticles at 268 K, 248 K and 278 K respectively. Prototype sensors of prepared $Zn_xCd_{1-x}TiO_3$ (x=0.25, 0.5, 0.75) nanoparticles were tested at 10 ppm, 20 ppm, 30 ppm and 40 ppm of methanol at room temperature. The $Zn_{0.75}Cd_{0.25}TiO_3$ and $Zn_{0.25}Cd_{0.75}TiO_3$ nanoparticles sensors exhibited fast response and recovery times and a linear response with increase in methanol concentration. The $Zn_{0.5}Cd_{0.5}TiO_3$ nanoparticles sensors exhibited nonlinear response and slow response and recovery times. Response of sensors based on all compositions was stable over period of 30 days.

Keywords: Solid state reaction, Zn modified $CdTiO_3$, Nanoparticles, PTCR, Conduction mechanism, Methanol sensing

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