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Gas sensing properties of rare-earth substituted MgFe2O4 ferrite nanoparticles

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MgCexFe 2-xO4 ($0 \leq x \leq 0.4$) nanoparticles have been produced by the glycol-thermal technique and characterized by X-ray diffraction, electron microscopy, X-ray photoelectron spectroscopy, Mössbauer spectroscopy, and gas sensing analyses. The X-ray diffraction results indicated that a pure cubic spinel phase was formed for samples having a low concentration of Ce, but the high Ce doping ($x < 0.2$) of magnesium ferrite resulted in the formation of secondary phases. The crystallite size of the compounds ranged from 2.2 nm to 15.3 nm. The 57Fe Mössbauer spectra showed the transformation from an ordered to a paramagnetic spin state with an increase in Ce concentration. Gas sensors fabricated from the spinel ferrites were tested towards various organic compound vapours (acetone, methanol, p-xylene, ethylbenzene, toluene, and benzene) at an operating temperature of 225 ℃. The MgCe0.2 Fe1.8O4 nano ferrite proved to possess quality sensor characteristics of high sensitivity and selectivity to acetone vapour, with a response of over 500@100 ppm concentration as well as reproducibility, reversibility, and stability of over 120 days.

Apply to be considered for a student ; award (Yes / No)?

N/A

Level for award;(Hons, MSc, PhD, N/A)?

N/A

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