

عنوان مقاله:

Studying the effect of calcination on optical and magnetic properties of NiFe₂O₄@Ti-doped ZnO nanoparticles

محل انتشار:

سیزدهمین کنگره سرامیک ایران و سومین کنفرانس بین المللی سرامیک ایران (سال: 1401)

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نویسندگان:

Zahra Abdi - Department of Materials Science and Engineering, Sharif University of technology, Tehran, Iran

Adrine Malek Khachatourian - Department of Materials Science and Engineering, Sharif University of technology, Tehran, Iran

Ali Nemati - Department of Materials Science and Engineering, Sharif University of technology, Tehran, Iran

خلاصه مقاله:

A novel magnetically separable NiFe₂O₄@Ti-doped ZnO nanosphere was synthesized using the heterogeneous nucleation of Ti-doped ZnO nanoparticles on NiFe₂O₄ polycrystalline nanospheres by hydrothermal method. Structural and microstructural properties of synthesized polycrystalline nanospheres were studied by X-ray diffraction (XRD), Fourier-transform infrared spectra (FTIR), Field emission scanning electron microscopy (FESEM) with an energy-dispersive X-ray spectrometer (EDX), and Transmission electron microscopy (TEM). The effect of calcination on optical and magnetic properties is also investigated. The optical properties of synthesized nanoparticles were investigated using UV-vis spectroscopy which shows the absorption peak in the visible region. The band gap energy of pure ZnO, Ti-doped ZnO, and NiFe₂O₄@Ti-doped ZnO before and after calcination was calculated ۳.۲۱ eV, ۲.۹۲ eV, ۲.۴۴ eV, and ۲.۰۴ eV, respectively. A vibrating sample magnetometer (VSM) was employed to study magnetic features that the saturation magnetization (Ms) of NiFe₂O₄ and NiFe₂O₄@Ti-doped ZnO non-calcined and calcined was obtained ۶۳.۶ emu/g, ۲۱.۳ emu/g, and ۱۵.۳ emu/g, respectively. Hence, the results represented that the calcination of NiFe₂O₄@Ti-doped ZnO nanosphere improved the optical properties and reduced the band gap energy. However, NiFe₂O₄ combination with nonmagnetic matrix and calcination of NiFe₂O₄@Ti-doped ZnO nanoparticles decrease the saturation magnetization (Ms) value and response to the external magnetic field.

کلمات کلیدی:

Magnetic Nanoparticles, heterogeneous nucleation, hydrothermal method, band gap engineering, saturation magnetization

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