

The International Debate on Photodynamic Therapy by Er and Yb Doped TiO₂ Upconversion Nanoparticles

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Photodynamic therapy that has been developed over last century, now has become more widely used medical tool for the treatment of various diseases such as cancer. This technique involves delivery of photosensitizing drugs, irradiation of light and motivation of drugs. The limitation of light penetration in body tissue, may resolve by application of upconversion nanoparticles. Upconverting nanoparticles could help treatment of cancer tumors in deep or critical points of body by converting high penetrating Near-Infrared emissions to higher energy visible emissions. In the present work, rare earth elements doped TiO₂ nanoparticles are synthesized. The photodynamic properties of rare earth elements doped TiO₂ of prepared samples are studied. Photodynamic performance is investigated for health benefits applications.

In this research, TiO₂ upconversion nanoparticles doped Er³⁺ and Yb³⁺ to use in photodynamic cancer therapy, were produced by sol-gel method.

Phase structure and optical properties of nanoparticles were investigated by photo luminescent by laser, U-V visible, Fourier transform infrared spectroscopy, X-Ray diffraction and X-Ray photoelectron spectroscopy. Existence of Er₂Ti₂O₇ and Yb₂Ti₂O₇ phases in XRD test illustrate that dopants entered the matrix structure and also the peaks in PL test recognized this matter. Upconversion radiation was observed due to exciting by near infrared laser diode with 980nm wavelength. Photoluminescence spectroscopy confirmed the green emission appears between 520-570nm and red in 640-690nm and blue in 408nm. And these nanoparticles used as drug for cancer therapy for in-vivo tests and appropriate results achieved.

Biography:

Pooria Akbari is graduated in Master of Science in material science-nanotechnology from Sharif University of Technology in year 2016 at the age of 25.