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Modified urea route synthesis for studies on the structural properties of Sm3+ and Nd3+ dopedY2O3 nanoparticles

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Rare earth doped nanoparticles have been identified to possess excellent crystallographic stability with characteristics that suit their utility in vast applications such as waveguides, coating material under severe reactive conditions, oxide hosts in lasers and their fluorescence properties have been identified to possess multitude of industrial applications. Yttrium oxide is one of the most passable of the yttrium compounds, which finds itself in the midst of fabrication from solid state laser ceramics to high temperature superconductors. RE3+:Y2O3 nano particles have been prepared using samarium and neodymium for the dopant RE3+. Rare earth doped yttrium oxide nano particles were synthesized successfully using a simple and low cost modified precipitation method using urea. Characterization of nanoparticles using XRD indicated the formation of RE3+:Y2O3 nano particles in various crystalline orientations after verification where all the impurity peaks that existed with the powder in its dry form at 300°C vanished after calcination at 900°C. The mean size of the particles has been found to be between 80-150 nm. The mean crystallite size ranges have been estimated from the broadening of diffraction peaks and the results were found to be in agreement with size analysis measurement.

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TiO_2 adsorbed on cement balls for effective photomineralization of organic pollutants under UV light irradiation

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Organic pollutants like phenols and organic dyes present in industrial waste water are posing a hazardous threat to aquatic ecosystem. Several measures have been adopted for the neutralization and photodecomposition of these harmful organic moieties, among these semiconductor photocatalysis has been provided a major thrust after the discovery of Honda-Fujishema effect. Present study demonstrates the adsorption of TiO2-P25 in nano size (~36 nm) on cement balls for effective photodegradation of Alizarin and penta chlorophenol (PCP) under UV light illumination. Triton-X was used as a stabilizer for effective adsorption of TiO2 on cement balls (TCB) followed by calcination at ~300oC for 4 h. The TCB's were dispersed randomly in a self-designed reactor for phototcatalytic performance. The change in concentration of alizarin and PCP was observed under UV-Vis spectroscopy, PCP was detoxified within 40 min while alizarin photo-decomposed within 15 min of UV light irradiation. Taking into consideration the go green slogan and future prospective, this technique can be also utilized under visible light and on mass scale because this is an effective tool for environmental remediation and waste water treatment.

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