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CONTROLLED FLUORESCENCE IN CHEMICALLY MODIFIED POROUS SILICA NANOPARTICLES

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Porous silica nanoparticles are a special class of nanoparticles with potential applications in numerous areas, such as drug-delivery systems, bio-sensing, bio-labeling, or as additives to polymer coatings. For these applications, fluorescence property is suitable and therefore modification of silica nanoparticles to make them fluorescent is becoming a regular process. In our research, the synthesis of porous silica nanoparticles was performed through a simple and cost-effective wet chemistry route using cetyltrimethyl ammonium bromide (CTAB) as a template and structure directing agent and tetraethyl orthosilicate (TEOS) as silica precursor. Various characterization techniques, such as electron microscopy, FTIR (fourier transform infrared spectroscopy), and helium-pycnometry were used to characterize the porous nanoparticles. The fluorescence properties of the silica nanoparticles were further investigated by modifying the synthesized nanoparticles with 3-aminopropyl triethoxysilane (APTES). Silane modified silica nanoparticles were found to exhibit visible light fluorescence with variable intensity and wavelengths that were controlled by calcinating the nanoparticles at different temperatures. X-ray photoelectron spectroscopy (XPS) analysis of the calcined nanoparticles revealed the presence of C, N, and O within the silica lattice, suggesting these impurities as the possible source for the visible light fluorescence exhibited by the porous silica nanoparticles. Such defects were found to be removed when nanoparticles were calcined at higher temperatures (800°C), resulting in the disappearance of visible light fluorescence from the porous nanoparticles.

BIOGRAPHY

Shadmani Shamim has completed her Master of Engineering degree in Nanotechnology in December 2017 from Asian Institute of Technology, Thailand. Previously she did her bachelor's degree in Electrical and Electronic Engineering from Ahsanullah University of Science and Technology, Bangladesh. Currently, she is working as a Researcher in the Center of Excellence in Nanotechnology, AIT, Thailand. Her primary research interest is synthesis and characterization of nanomaterials.

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