**ABSTRACT**

Bismuth modified nitrogen doped TiO2 nanoparticles have been successfully prepared by two steps synthesis route which includes hydrothermal and impregnation hydrolysis method. Samples were characterized using X-ray diffraction (XRD), N2 physical adsorption, Transmission electron microscopy (TEM), UV–vis diffuse reflectance spectroscopy (UV–vis DRS), Fourier Transmission Infrared (FTIR), Raman, X-ray photoelectron spectroscopy (XPS) and photoluminescence spectroscopy (PLS) technologies. The preparatory method afforded the production of well crystallized spherical Bi modified N-doped TiO2 nanoparticles with varied amounts of Bi content. XRD analysis results reveal that Bi exists as rare metastable Bi20TiO32 which started to surface at Bi loading content of 7 mol% in relation to Ti ions. All Bi modified N–TiO2 samples exhibited higher photocatalytic activity toward degradation of 2,4-DCP over N–TiO2 under visible light irradiation. The sample with 10% composition of the Bi20TiO32 exhibited the highest activity. The superior photocatalytic performance of 10%Bi/N–TiO2 is attributed to high visible light absorption as well as effective charge carrier separation. Therefore, the role of Bi species in the N–TiO2 is improvement of visible light harvesting and facilitation of charge carrier separation hence alleviating electron–hole recombination.