Abstract

Scandium and carbon co-doped TiO_2 catalyst was prepared through a simple sol–gel synthesis method by using scandium nitrate as scandium dopant precursor, glucose as carbon precursor and tetrabutyl orthotitanate as titanium precursor and calcined them at 450°C for 3 h. The characterizations of the prepared samples were accomplished through X-ray diffraction (XRD), transmission electron microscopy (TEM), UV–visible diffuse reflectance spectroscopy (UV–Vis DRS), photoluminescence spectroscopy (PL), Fourier transformation infrared spectroscopy (FT-IR), X-ray photoelectron spectroscopy (XPS) and Brunauer–Emmett–Teller (BET). The X-ray diffraction results of the samples showed the decrease in the crystal size of the sample with the subsequent increase in the specific surface area as shown by Brunauer–Emmett–Teller. The UV–visible diffuse reflectance spectroscopy displayed the blue shift in the absorption together with the photoluminescence spectroscopy revealed the decrease in the recombination of electrons and holes by the addition of the scandium and then after the certain optimum value, the further increase of the scandium further increased the recombination of electrons and holes. The photo-catalytic activity of the samples was investigated with the help of photo-catalytic degradation of Acid orange 7 under visible light irradiation. The degradation of Acid orange 7 was highly increased for the Sc and C co-doped samples compared to the single C doped sample. And the sample 0.2 Sc/C-TiO_2 had the maximum increase. The enhanced photo-catalytic performance was due the decrease of the crystal size, increase of the surface area, increase in the surface hydroxyl groups, and increase of the lifetime of the electrons and holes because of the synergistic effect of the Sc and C co-doping in TiO_2.