Abstract

Mesoporous Titania-silica composite (MTSC) with a large surface area (387m^2/g) and large pore volume was synthesized by a two steps condensation sol-gel method. Transparent TiO_2 sol was formed at room temperature through condensation and peptization of titanium oxychloride solution using ammonium hydroxide and aqueous nitric acid respectively. Sodium silicate was used as a silica source to form a composite with the preformed TiO_2 sol. The physical properties of the composite were examined by Fourier Transform infrared (FTIR), BET surface area, Thermogravimetric analysis (TGA), scanning electron microscopy (SEM), transmission electron microscopy (TEM) and X-ray diffraction (XRD). The nitrogen physisorption behaviour of the synthesized composite was compared to that obtained from grafting and one-pot co-condensation methods using the same precursors in the presence of Cetyltrimethylammonium bromide (CTAB). It was found that MTSC synthesized under this method possessed large pore sizes and pore volume but its thermal stability was comparatively low. FTIR spectra showed the formation of a Ti-O-Si bond at 940 cm^{-1} suggesting that titania was incorporated in silica to form a composite. The XRD patterns showed that the major phase of the titania had an anatase phase up to 900^0C but it transforms into rutile when calcined at 1000^0C. Furthermore the EDS studies of the as-synthesized and calcined samples substantiated the formation of titania-silica composites.