Abstract

Zeolite Na-A supported $TiO_2$ nanopowders were synthesized via a modified sol–gel technique and the effects of $TiO_2$ loading were characterized for thermal, structural, morphological, optical and textural behaviour. Thermal properties predicted a minimum annealing temperature of 600 °C whereas the X-ray diffraction (XRD) patterns indicated that the composite was highly crystalline, and consisted of both $TiO_2$ and zeolite Na-A peaks. Scanning electron microscopy (SEM) images confirmed that the $TiO_2$ nanoparticles occurred mainly on the surface of the zeolite Na-A support. Nitrogen adsorption–desorption studies portrayed increased porosity and larger surface area for $TiO_2$/zeolite Na-A compared to pure $TiO_2$. The optical band gap decreased with increased $TiO_2$ loading from 3.17 to 2.85 eV. The synthesized nanopowders were applied in photocatalytic dye removal, where by the highest degradation rate for the supported $TiO_2$ was realized at 1.5 %$TiO_2$/zeolite Na-A loading. It was found that loading beyond 1.5 %$TiO_2$ led to a structural collapse and decline in the photodegradation rate.