ET-P009

Photocatalytic Activity of Hierarchical N doped TiO2 Nanostructures

Brundabana Naik, Sun Mi Kim, Chan Ho Jung, Jeong Young Park*

Graduate School of EEWS (WCU) and NanoCentury KI, KAIST
(Korea Advanced Institute of Science and Technology), Daejeon 305-701, Korea

Hierarchical N doped TiO2 nanostructured catalyst with micro, meso and macro porosity have been synthesized by a facile self-formation route using ammonia and titanium isopropoxide precursor. The samples were calcined in different calcination temperature ranging from 300^{o}C to 800^{o}C at slow heating rate (5^{o}C/min) and designated as NHPT-300 to NHPT-800. TiO_2 nanostructured catalyst have been characterized by physico-chemical and spectroscopy methods to explore the structural, electronic and optical properties. UV-Vis diffuse reflectance spectra confirmed the red shift and band gap narrowing due to the doping of N species in TiO2 nanoporous catalyst. Hierarchical macro porosity with fibrous channel patterning was observed (confirmed from FESEM) and well preserved even after calcination at 800^{o}C, indicating the thermal stability. BET results showed that micro and mesoporosity was lost after 500^{o}C calcination. The photocatalytic activity has been evaluated for methanol oxidation to formaldehyde in visible light. The enhanced photocatalytic activity is attributed to combined synergetic effect of N doping for visible light absorption, micro and mesoporosity for increase of effective surface area and light harvestation, and hierarchical macroporous fibrous structure for multiple reflection and effective charge transfer.

Keywords: Photocatalysis, Hierarchical porous material, Visible light, Nitrogen-doped TiO2