

Abstract

The enhancement of the **photodegradation** of toxic *N*-nitrosodimethylamine (NDMA) in water using amorphous **manganese oxide** (AMO) and platinum manganese oxide (Pt/Mn₃O₄) catalysts was investigated. Characterization of the catalysts was carried out using XRD, FESEM, TEM, EDXS, BET, XPS, and AOS. Pt/Mn₃O₄ and its precursor AMO, synthesized by a **redox reaction** of Mn²⁺ and Mn⁷⁺, showed similar morphologies. High surface area AMO was confirmed to be amorphous, whereas Pt/Mn₃O₄ was a mixture of two crystalline structures. The optimum catalyst loading was 25 mg per 100 mL NDMA solution for which the **photocatalytic activity** was maximized. The average hydrodynamic particle size of a given amount of catalyst increased due to aggregation as a result of an increase in temperature during UV **illumination** ($\lambda = 254$ nm). Photocatalytic studies showed that NDMA degraded according to zero-order kinetics under air saturation at pH 7.0. AMO and Pt/Mn₃O₄ showed photostability and comparable activities with pure TiO₂ and platinumized TiO₂. Mixed valencies of Mn and the presence of O₂ on the surface of the catalysts, which reacts with photogenerated electrons to form **reactive oxygen species** (hydroxyl and **superoxide anion** radicals), played significant roles in the enhancement of the photodegradation of NDMA in water.