

Abstract

Crystalline tunnel structure cryptomelane type manganese oxides (OMS-2) have been studied as photocatalysts for the selective oxidation of 2-propanol to acetone. The reaction is carried out with visible light irradiation at room temperature. The activities of various K-OMS-2 and metal doped OMS-2 (M-OMS-2) catalysts prepared by different synthesis procedures have been evaluated. K-OMS-2 and M-OMS-2 (M = Fe, Ni) with nanorod morphology were the most active photocatalysts. Conversions obtained for these catalysts ranged from 50 to 15%. K-OMS-2 fibers gave only 5–6% conversion. All reactions gave 100% selectivity to acetone. The reusability of the K-OMS-2 catalyst was also tested. Characterization of K-OMS-2 catalysts was done using several techniques like temperature programmed desorption, UV–vis spectroscopy, average oxidation state analysis, XRD, BET and FE-SEM. As suggested by the photochemical and characterization data, synthesis methodology, morphology, mixed valency and the release of oxygen from the OMS-2 structure are important factors for the design of active OMS-2 photocatalysts. XRD and FTIR were also used to study structural changes in the catalyst after photolysis.