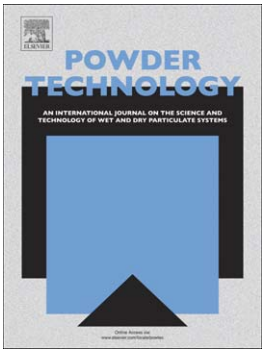

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Oxidation of Gaseous Formaldehyde with Ozone over MnOx/TiO_2 Catalysts at Room Temperature (25°C)

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Abstract

The TiO_2 support materials were synthesized by a chemical vapor condensation (CVC) method and the subsequent MnOx/TiO_2 catalysts were prepared by an impregnation method in our previous studies. Catalytic oxidation of formaldehyde on the MnOx/TiO_2 catalysts was examined with ozone. Formaldehyde (HCHO) is a specific volatile organic compound (VOC) found in indoor air of both residential places and workshops and must be removed to improve air quality. Catalytic oxidative decomposition of HCHO at room temperature (25°C) is considered one of the most promising strategies for this. In this study, MnOx/TiO_2 was prepared using chemical vapor condensation (CVC) as a HCHO ozone (O_3) catalyst that operates at 25°C. In this catalytic oxidation experiment, the HCHO of the gas stream on the MnOx/CVC-TiO_2 catalyst was completely oxidized to CO_2 with the addition of O_3. The removal efficiency of HCHO increased from 35.3% to 100% as the O_3:HCHO ratio increased from 1 to 5. CO_X selectivity also increased significantly with the increasing O_3:HCHO ratio. As the relative humidity (RH) increased, HCHO removal efficiency and mineralization to CO_2 increased. The HCHO removal efficiency increased to 100% at RH = 50%, whereas it was 85% at RH = 10%. The mineralization to CO_2 increased to 100% at RH = 80%, and was 15% at RH = 10%.