63d Catalytic Oxidation of Dichlorobenzene over V2o5/Tio2 in the Presence of Water

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Chlorinated VOC emissions are stringently regulated in several countries around the world. In particular, the release of polychlorinated dibenzo dioxins and/or furans (PCDD/F) is highly restricted. Chlorinated aromatics are frequently used in laboratory studies as model compounds for the catalytic oxidation of PCDD/Fs, a process that currently represents the state of the art technology for their destruction in the flue gas of municipal and medical waste incinerators. Our group has previously studied the oxidation of different chlorobenzenes and chlorophenols over V2O5/TiO2 under dry conditions. We have now investigated the effect of adding water during this process and have observed substantial changes in the presence of water. More specifically, kinetic results obtained with different dichlorobenzene isomers indicate that the catalytic activity increased in the presence of water at temperatures below 250C and decreased at temperatures above 275C. Furthermore, the reaction order with respect to water varied with temperature. NH3-TPD and in situ FTIR studies were used to characterize the effect of water on surface acidity and to identify the chemical species present on the surface during reaction. Results from these studies indicate that surface acidity is altered by water treatment and the effect varies significantly with the treatment temperature. Furthermore, the concentration of available surface hydroxyl groups appears to have an effect on the type of surface intermediates formed, and therefore, the prevailing reaction pathways.