

Low temperature deep combustion of EtOH with supported Pt catalysts

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Low temperature deep oxidation of ethanol with high concentrations has been investigated using 0.65% Pt/SiO<sub>2</sub> and 1.21% Pt/TiO<sub>2</sub> catalysts prepared by an ion exchange method. The titania- and silica-supported Pt samples consisted of nanoparticles with the respective sizes of 1.2 and 24.6 nm, as determined using H<sub>2</sub>-N<sub>2</sub>O titration and X-ray line broadening techniques. At low temperatures ranging from 120 to 180°C, EtOH with a concentration of 3% was completely oxidized over a sample of the 1.21% Pt/TiO<sub>2</sub> catalyst, and during this combustion there was no formation of byproducts including formaldehyde, acetaldehyde, acetic acid, and diethyl ether. The 0.65% Pt/SiO<sub>2</sub> catalyst with much larger Pt nanoparticles showed a combustion performance which was very similar to that indicated for the titania-supported Pt. These results represent that such a particle size of Pt metals might not be a critical variable in the low temperature EtOH oxidation, and propose that low grade EtOH can be used as an alternative fuel when being coupled with a catalytic combustion technology and is a better heating source because of lower CO<sub>2</sub> emissions, by 20%, compared to conventional fossil fuels, such as heating oils.