Preparation of Supported Pd Catalysts from Liquid Carbon Dioxide

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Supported palladium (Pd) catalysts were prepared using an environmentally benign route. Pd (II) hexafluoroacetylacetonate ($Pd(hfac)_2$) was impregnated into a low surface area (14.7 m^2/g) alumina and high surface area (220 m^2/g) alumina pellets based on liquid carbon dioxide ($l-CO_2$). After depressurization to remove the CO_2 and unabsorbed $Pd(hfac)_2$, the impregnated $Pd(hfac)_2$ was reduced in hydrogen at 75 °C. The Pd crystallite size on each support was measured by scanning electron microscopy (SEM) and transmission electron microscopy (TEM). The average crystallite size on the low surface area alumina increased from 12 nm to 72 nm and the Pd concentration increased from 0.15 to 1.54 wt% as the concentration of $Pd(hfac)_2$ in solution was increased from 0.6 to 10.5 wt%. When the high surface area alumina was used, the Pd crystallite size increased from 2.7 to 6.9 nm and the Pd concentration increased from 0.58 to 3.94 wt% as the solution concentration was increased from 1.2 to 27.8 wt%.