

165e Designing Pd-on-Au Bimetallic Nanoparticle Catalysts for Trichloroethene Hydrodechlorination

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Alumina-supported palladium (Pd) catalysts have previously been shown to hydrodechlorinate trichloroethene (TCE) and other chlorinated compounds in water, at room temperature, and in the presence of hydrogen. The feasibility of this catalytic technology to remediate groundwater of halogenated compounds can be improved by re-designing the Pd material in order to increase catalytic activity. We recently reported the synthesis of Pd supported on gold nanoparticles (Au NPs) of different Pd loadings (*Environ. Sci. Technol.* 2005, 39, 1346-1353). In all cases, we found that these catalysts were considerably more active than Pd NPs, alumina-supported Pd, and Pd-black (62.0, 12.2, and 0.42 L/gPd/min, respectively). There is a synergistic effect of the Pd-on-Au bimetallic structure, with the material with the highest TCE hydrodechlorination activity (943 L/gPd/min) comprised of Au NPs partially covered by Pd metal. In this paper, we discuss our efforts to heterogenize these core/shell nanoparticles for pilot-scale-testing, and to understand the source of catalytic enhancement resulting from the use of gold.