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Systematic Study of Supported Ni, Pd, Pt Metal Nanocrystals for Catalytic Energy Conversion VICKY DOAN-NGUYEN, University of Pennsylvania, MATTEO CARGNELLO, Univeristy of Trieste, THOMAS R. GORDON, KEVIN BAKHMUTSKY, University of Pennsylvania, PAOLO FORNASIERO, Univeristy of Trieste, RAYMOND GORTE, CHRISTOPHER B. MURRAY, University of Pennsylvania — Ni, Pd, and Pt nanocrystals ranging from 4-12 nm have been synthesized with great control in size and shape using a high-temperature chemical synthetic method for gas-phase catalytic testing. The tunability in size allows for controlled catalytic study of model reactions such as CO oxidation, CO hydrogenation and methane oxidation. The monodispersity of the particles allow for a systematic correlation between size and catalytic activity. There is consistent size dependence of CO oxidation for each of the metal systems on CeO2 support as indicated by the lower temperatures needed for full conversion. Our calculated activation energy using the Arrhenius equation for each size and material correlated with surface-area-to-volume ratio. Consistent with the light-off studies, the smallest particles were the most catalytically active under differential conditions. The same trend was observed for CO hydrogenation amongst each system. This trend was inverted for the oxidation of methane. This current study aims to elucidate the size dependence of catalytic activity in model systems with supported uniform nanocrystals.

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