Abstract Submitted
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**Size-dependent crystallinity of nano-Pt/$\gamma$-$Al_2O_3$**[1] LONG LI, Eng and Materials Sci Dept, Univ of Pittsburgh, L.-L. WANG, S. I. SANCHEZ, J. H. KANG, Univ of Illinois, Q. WANG, Yeshiva Univ, Z. ZHANG, Univ of Pittsburgh, A. I. FRENKEL, Yeshiva Univ, R. G. NUZZO, D. D. JOHNSON, Univ of Illinois, J. C. YANG, Univ of Pittsburgh — Metallic platinum nanoparticles (NP) on $\gamma$-$Al_2O_3$powders were synthesized with a size range from sub- to several nanometers. High-resolution transmission electron microscopy (HRTEM) studies revealed a size-dependent crystallinity of the Pt NPs, where Pt NPs with size <1 nm had a disordered structure, Pt NPs with size >2.5 nm all showed a crystalline structure. For Pt NPs with sizes between 1.1 and 2.4 nm, a transition zone exists in which ∼85% of NPs appeared disordered and ∼15% ordered. X-ray absorption spectroscopy (XAS) measurements support this result where increasing-disorder distribution of Pt-Pt bond lengths was noted with decreasing Pt nanoparticle size. A search for ground state structure of Pt37/$\gamma$-$Al_2O_3$ (100) with density functional theory (DFT) showed that the disordered structure is energetically more favorable than the ordered close-packed structures by 1.53 eV at the size of 1.1 nm.

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