Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

A fine-scale nanostructure in γ-alumina[1] GIANLUCA PAGLIA, EMIL BOZIN, SIMON BILLINGE, Department of Physics and Astronomy, Michigan State University, Biomedical Physical Sciences, East Lansing, MI, 48824-2320 — Despite the preeminent industrial importance of γ-alumina in catalysis, details of the structure remain unresolved due to its 15-30$\sim$nm domain nanocrystalline nature. Diffraction patterns are broad and single crystals are not available making accurate structural solution difficult using conventional crystallographic methods. We have applied a local structural technique, the atomic pair distribution function (PDF) analysis of powder diffraction, to obtain a quantitative structure. This is a total scattering technique that incorporates both Bragg and diffuse scattering information in the PDF, allowing all diffracted intensities from the XRD pattern to be equally considered. Surprisingly, we find a previously unknown fine-scale nanostructure with a domain size $\sim$ 1 nm. Within these nanodomains the oxygen sublattice is modified from the average structure and retains aspects of the boehmite precursor. This results in a novel and unexpected view of the γ-alumina structure since earlier controversies about it centered on the arrangement of Al ions among different cation sites, whereas the oxygen sublattice arrangement was not usually questioned.

[1]The work at MSU was funded under National Science Foundation (NSF) grant no. CHE-0211029. X-ray data were collected at beamline 6IDD of the Advanced Photon Source at Argonne National Laboratry.

Gianluca Paglia

Date submitted: 05 Dec 2005 Electronic form version 1.4