

Abstract Submitted
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Thermal and laser induced sintering in Pt nanoparticles studied by conventional and synchrotron x-ray diffraction¹ BRIAN KELLY, AARON LOETHER, Department of Physics and Astronomy, University of Delaware, RONALD CICHOCKI, Department of Chemistry and Biochemistry, University of Delaware, GERALD POIRIER, Delaware Environmental Institute, University of Delaware, MATTHEW DECAMP, KARL UNRUH, Department of Physics and Astronomy, University of Delaware — The thermal and laser induced sintering behavior of 5 – 6 nm Pt nanoparticles self- assembled into 50 nm diameter spherical aggregates has been studied by conventional and synchrotron-based x-ray diffraction (XRD) measurements. In the first instance, the aggregated Pt nanoparticles were solution annealed at temperatures between 120 and 215 °C over time periods from 10's to 100's of minutes. In each case the linewidth of the conventionally measured diffraction pattern consisted of a single component which systematically narrowed suggesting an increase in the size of the as-prepared nanoparticles. In a second set of experiments, the aggregated Pt nanoparticles were exposed to about 10,000 laser pulses, each with a duration of about 1 ps and an energy density of 250 mJ/cm². XRD spectra were acquired after each 100 lasers pulses corresponding to 100 ps of sample irradiation. A narrow line component was observed in the diffraction pattern after the first 100 laser pulses and dominated the lineshape after a few thousand laser pulses. These measurements reflect the effects of long term, low temperature atomic transport in comparison with high energy, short time transport.

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