Abstract Submitted
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In-situ observation of sintering of Mono-metallic nanoparticles VINEETHA MUKUNDAN, Purdue University, SHIYAO SHAN, JIN LUO, CHUAN-JIAN ZHONG, SUNY, Binghamton, OANA MALIS, Purdue University — Grain growth is detrimental in many applications of nanoparticles, especially for catalysis. During the physical processing of nanoparticles for various applications, they tend to coalesce and sinter. Upon grain growth, the size dependent physical and chemical properties of these nanoparticles undergo complete changes. For example, the nanoparticles need to be thermally activated to function as catalysts. However the thermal treatment renders these catalysts less efficient due to the decrease in electrochemically active area related to sintering. So it is imperative to study growth laws which predict the sizes of nanoparticles as a function of temperature to have better control of the structures and sizes in the nano-scale regime. The grain growth and sintering of Au, Pd and Cu nanoparticles of sizes 2-5nm were monitored using in-situ synchrotron based x-ray diffraction (XRD) in the temperature range from 500C to 800C. The data was compared to the empirical Kolmogorov-Johnson-Mehl-Avrami analysis and the activation energy was estimated. This was complemented with the study of transmission electron microscopy (TEM) data and mass transport analysis using basic sintering laws. The diffusion coefficients predicted from XRD and TEM were compared.

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