

Gold/Platinum Nanoparticles

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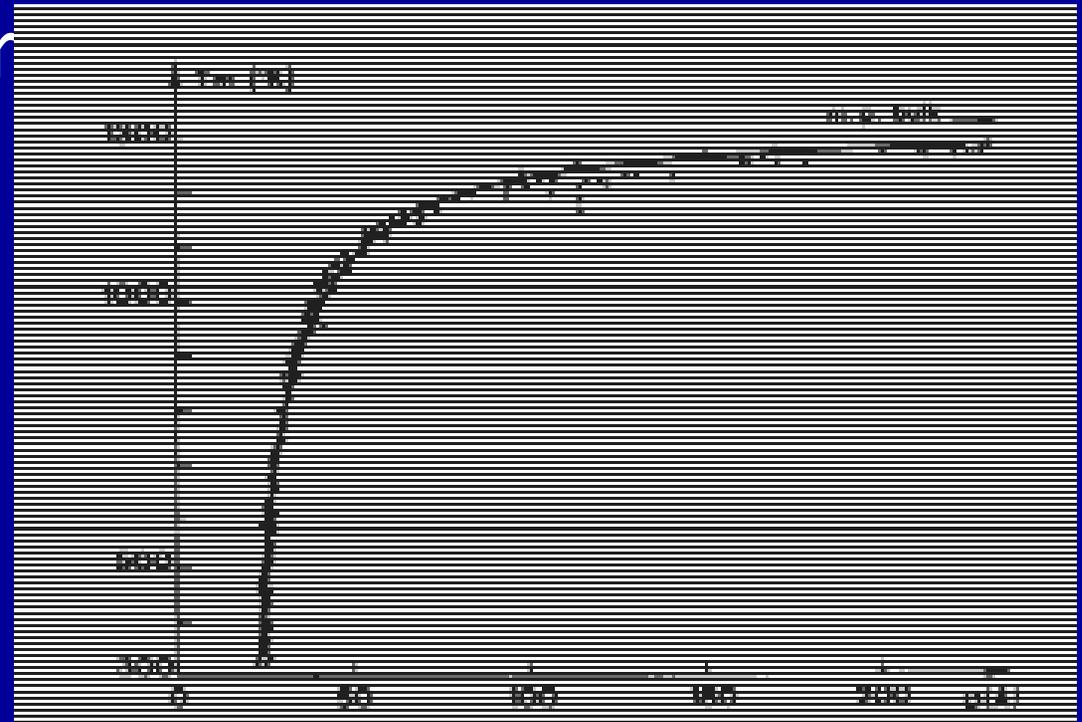
From Last Time...

- Au/Pt nanoparticles have potential to be used as catalysts in fuel cells
 - Behavior of particles is not well known
- In-situ heat treatments using synchrotron XRD

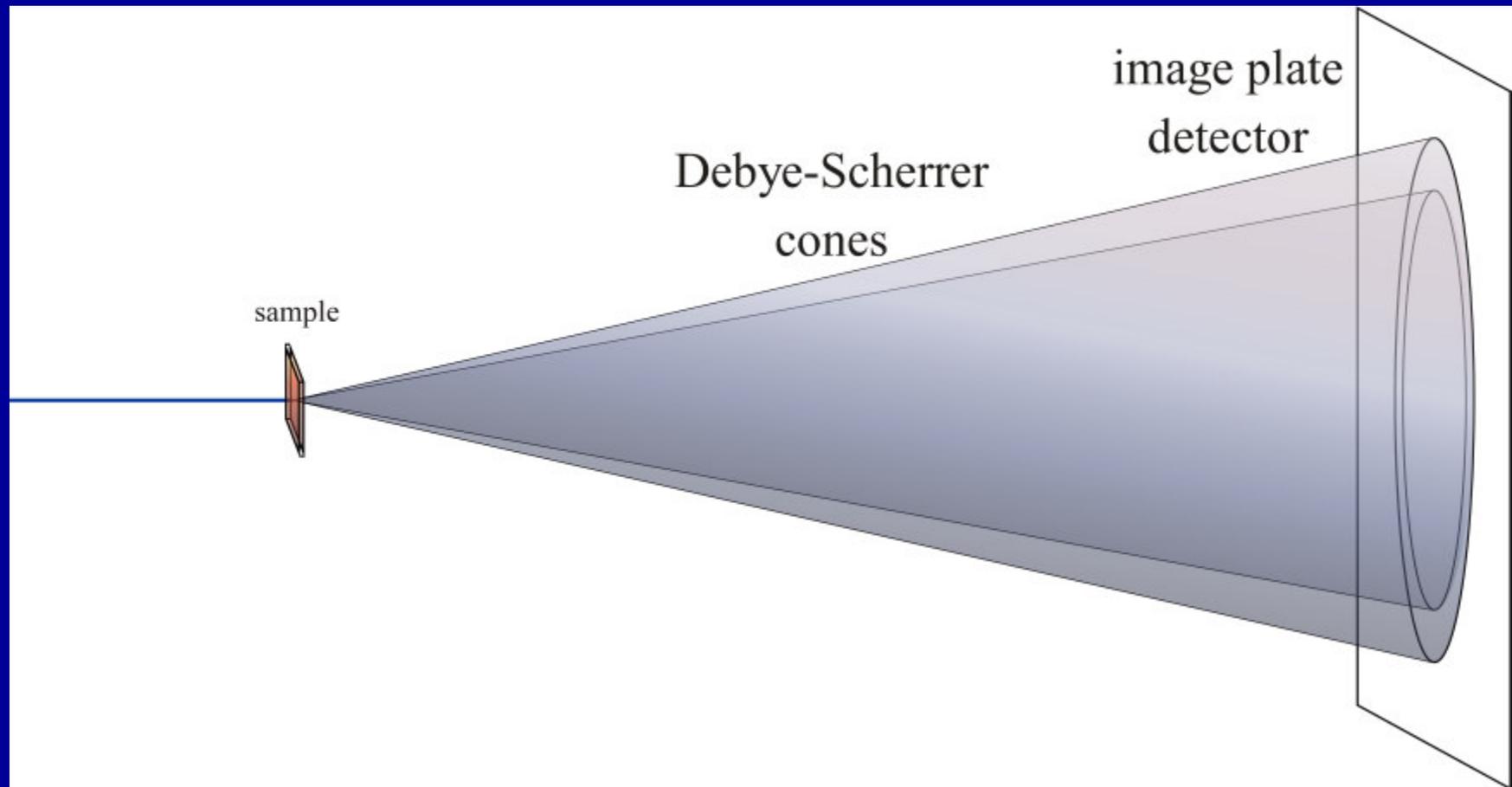


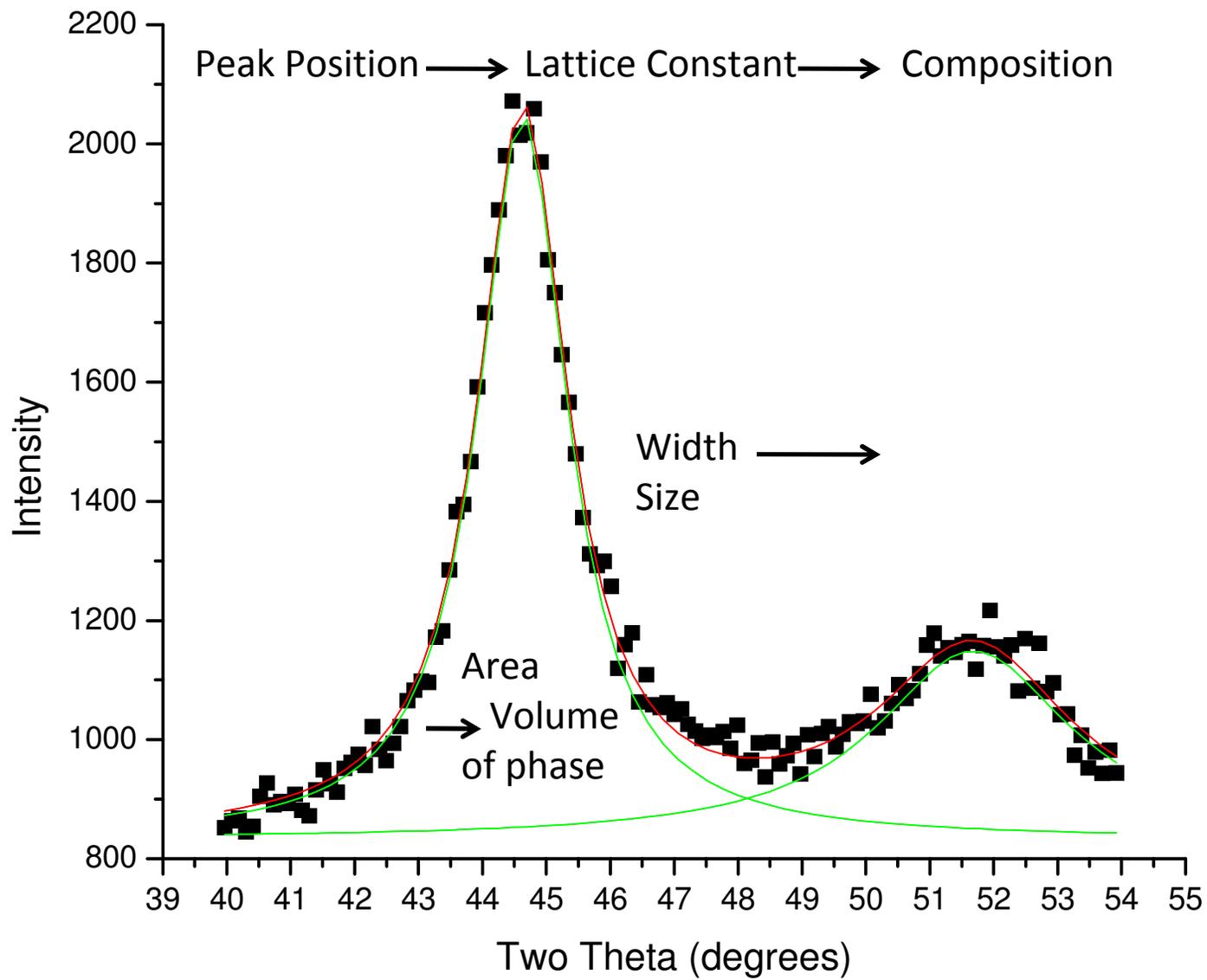
Nano vs. Bulk Properties

- high surface/volume ratio
- lower melting temperature
- miscibility

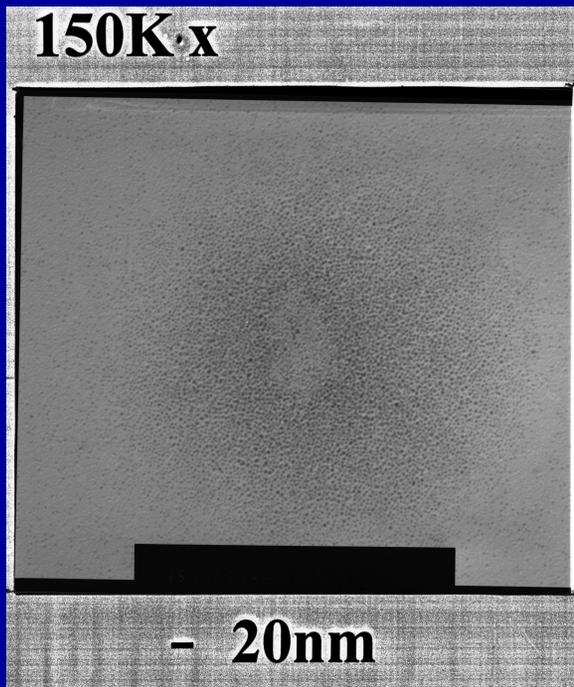


Powder Diffraction



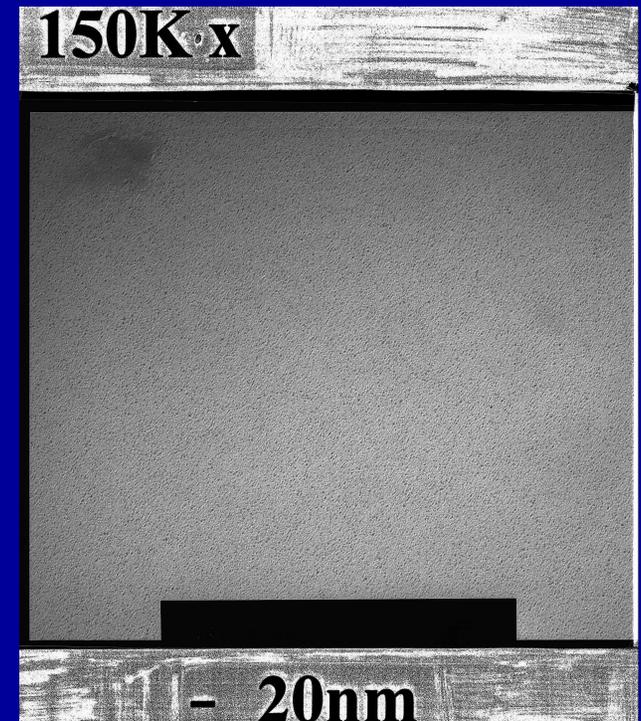
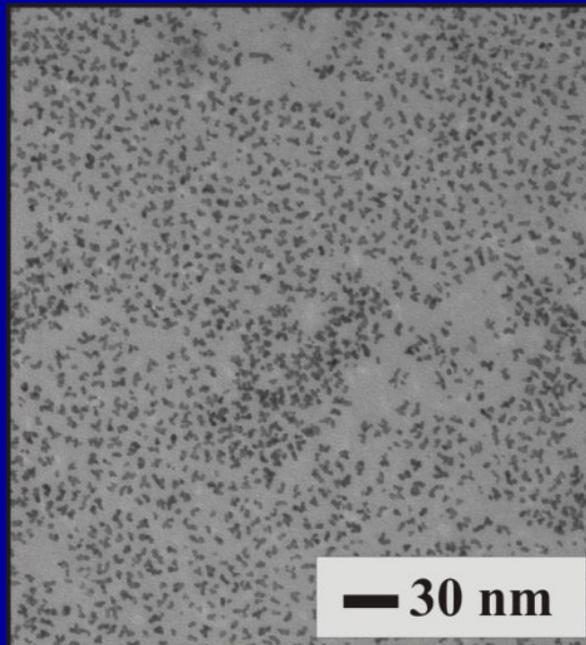


- Looking at 3 types of particles:
 - 2 Types of heat treatments



gold

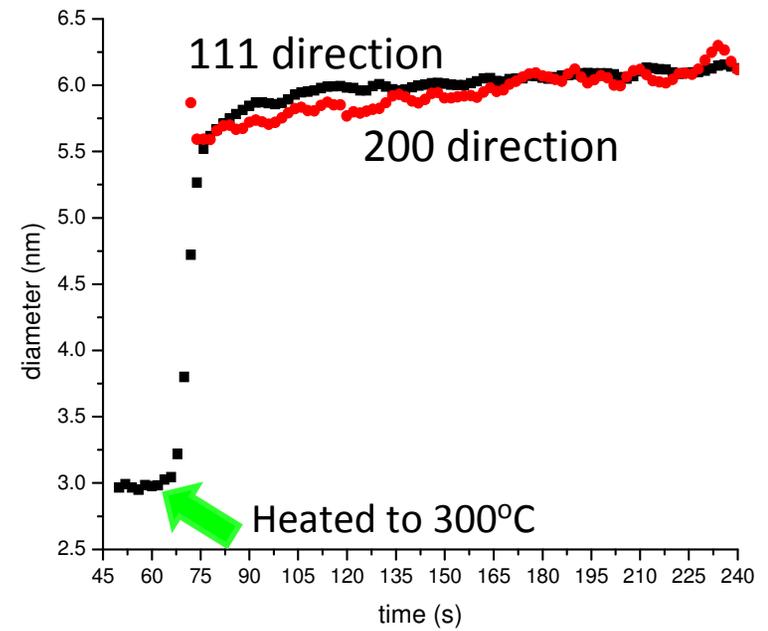
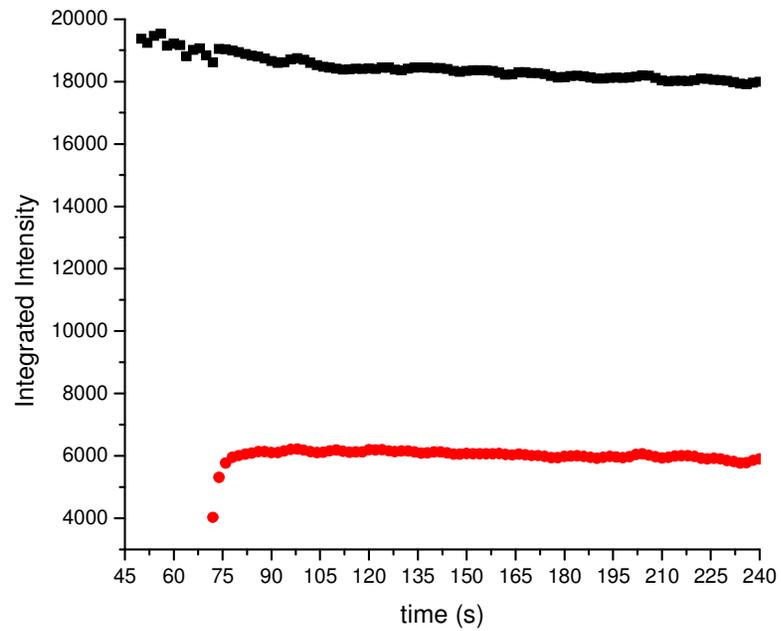
platinum

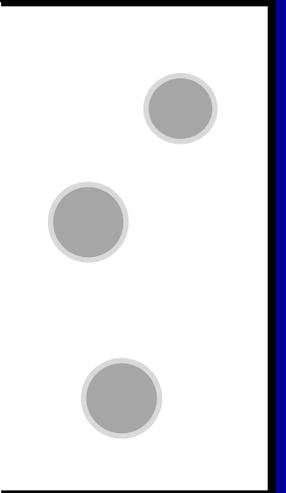
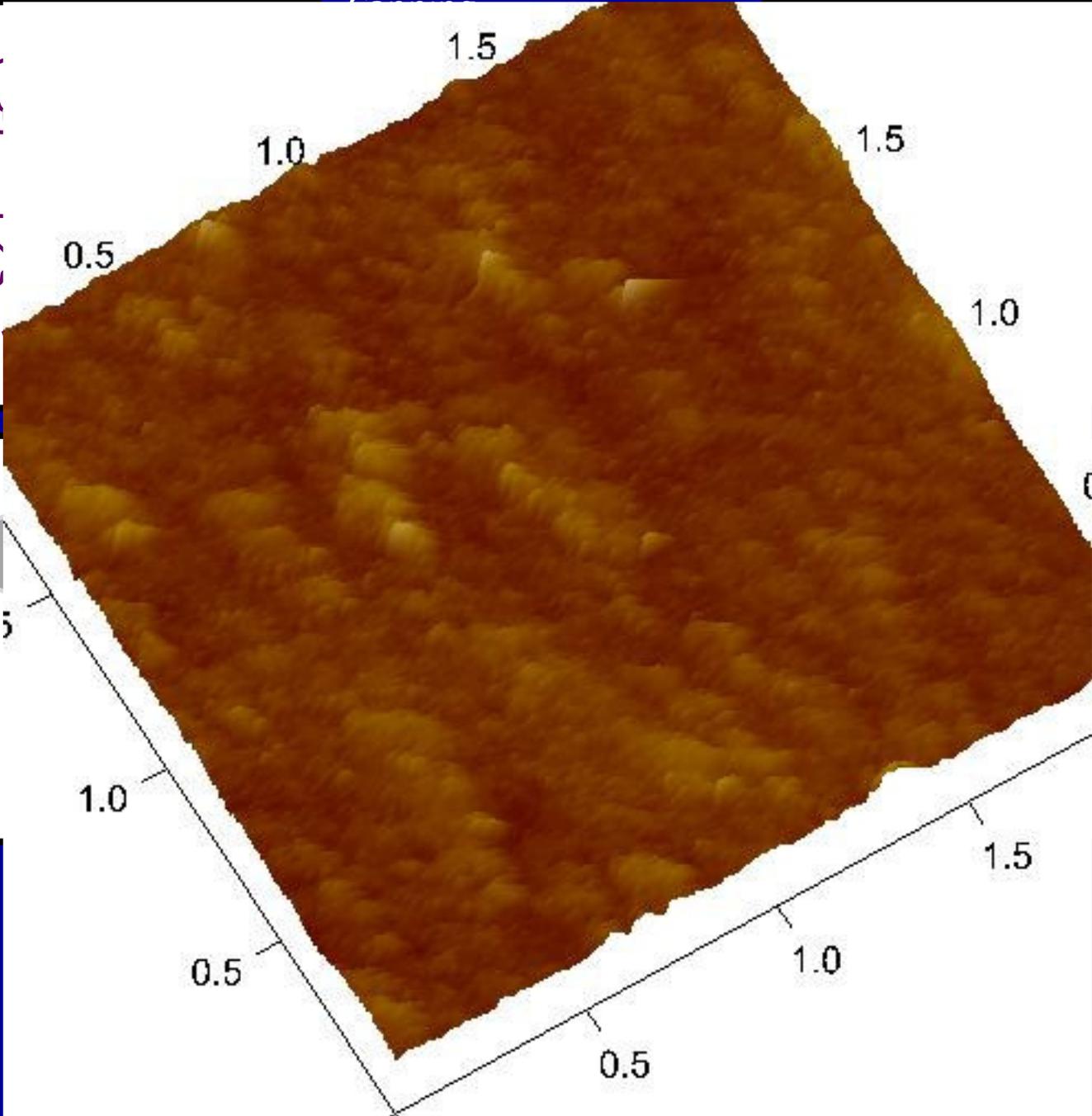
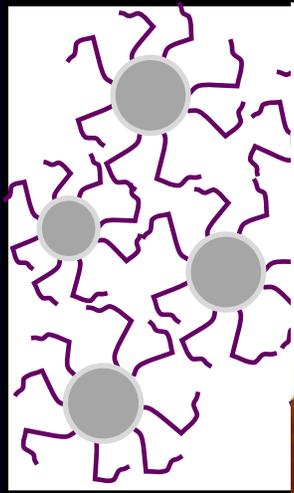


gold/platinum

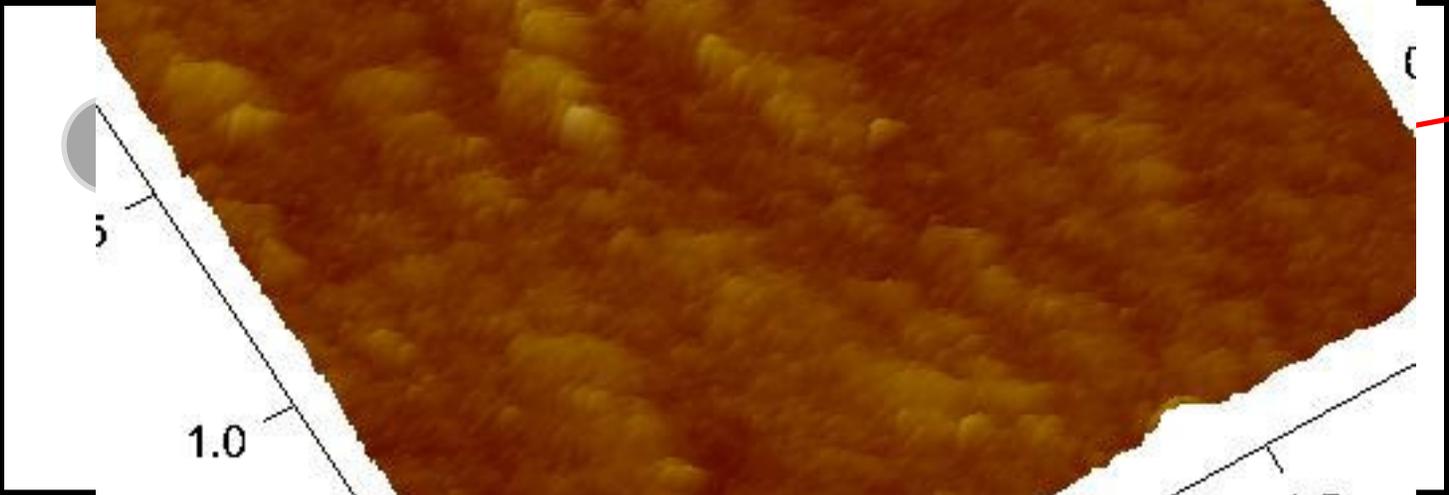
Platinum

300°C



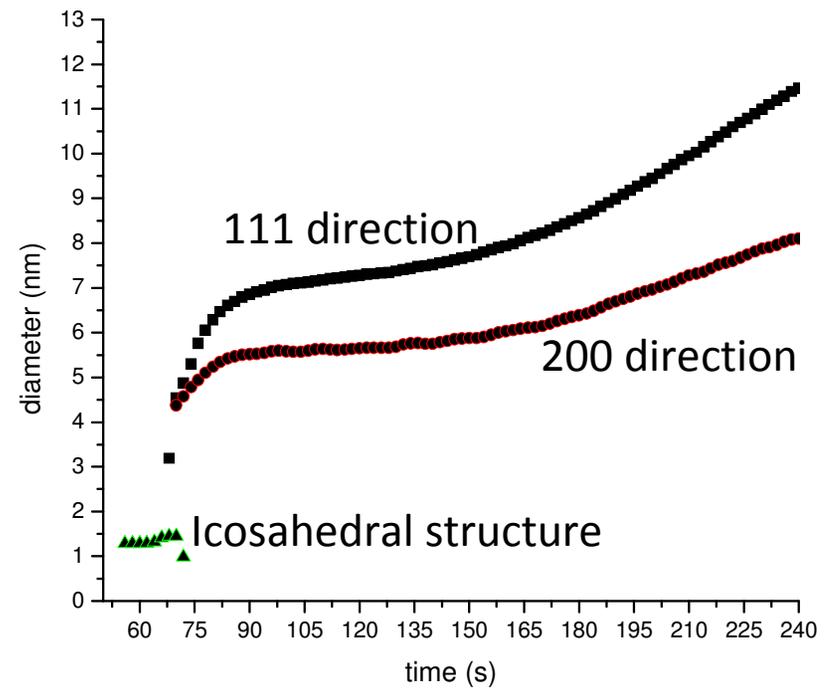
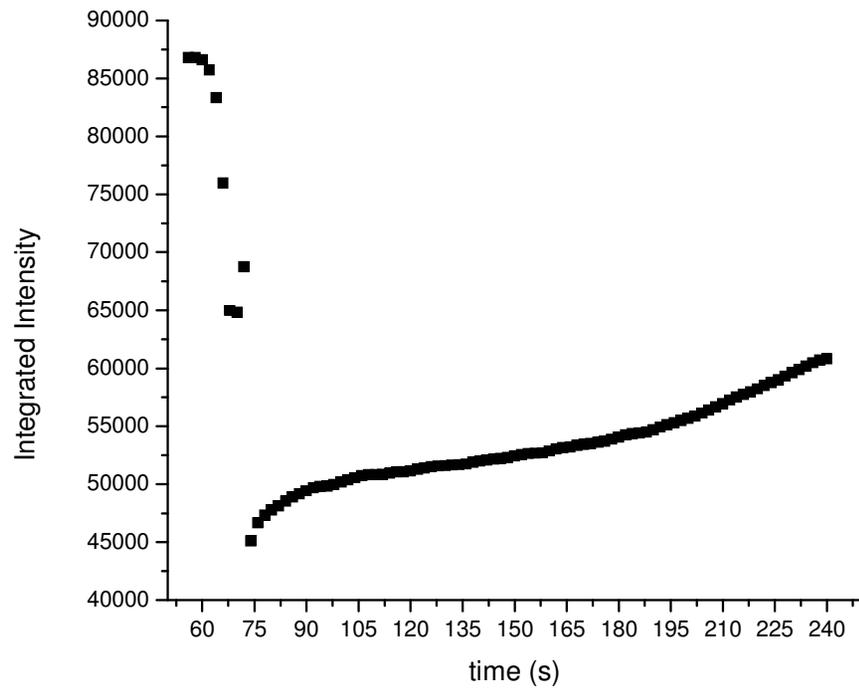


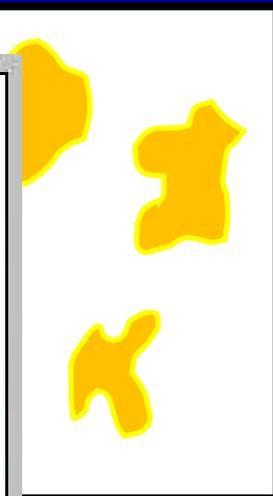
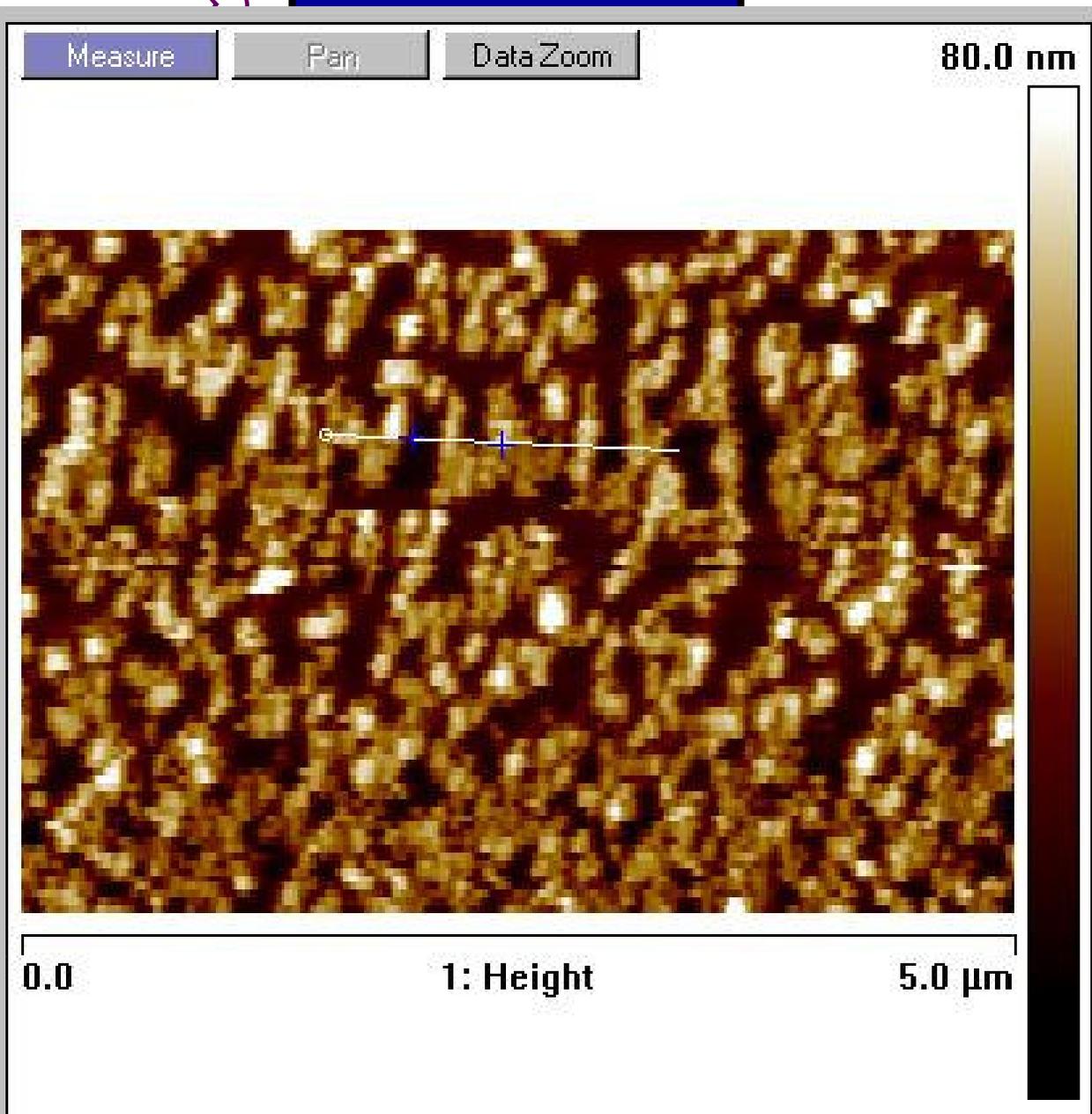
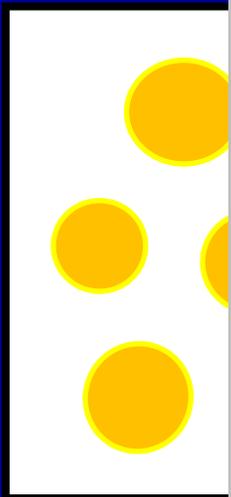
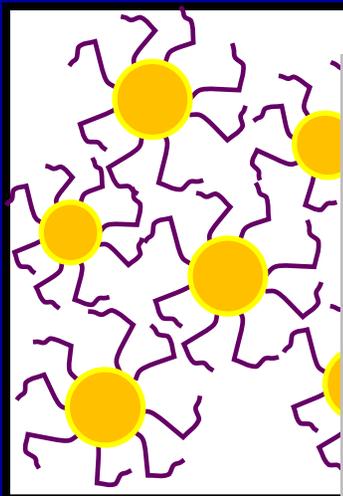
6 nm fcc particles



Gold

300°C



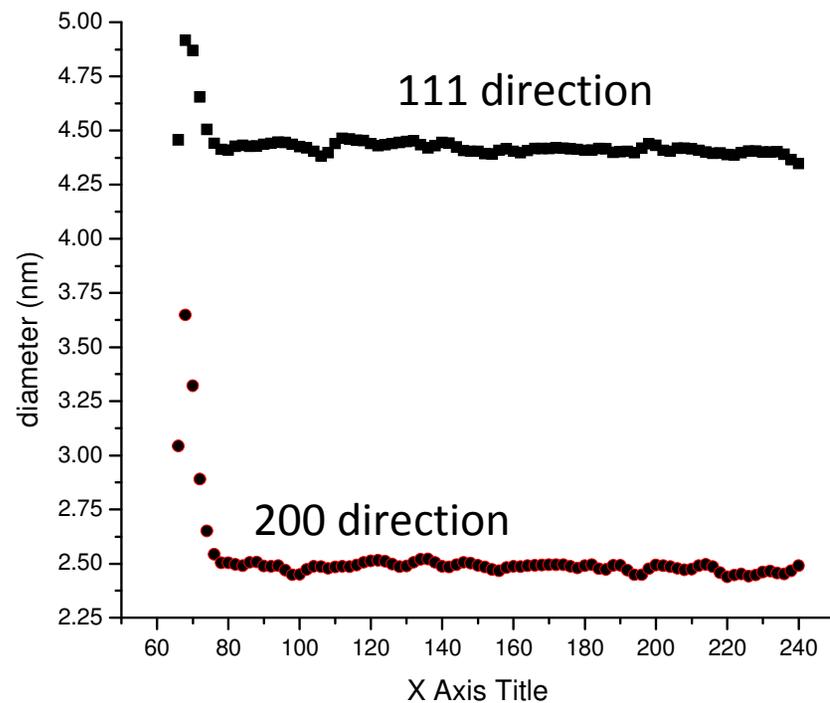
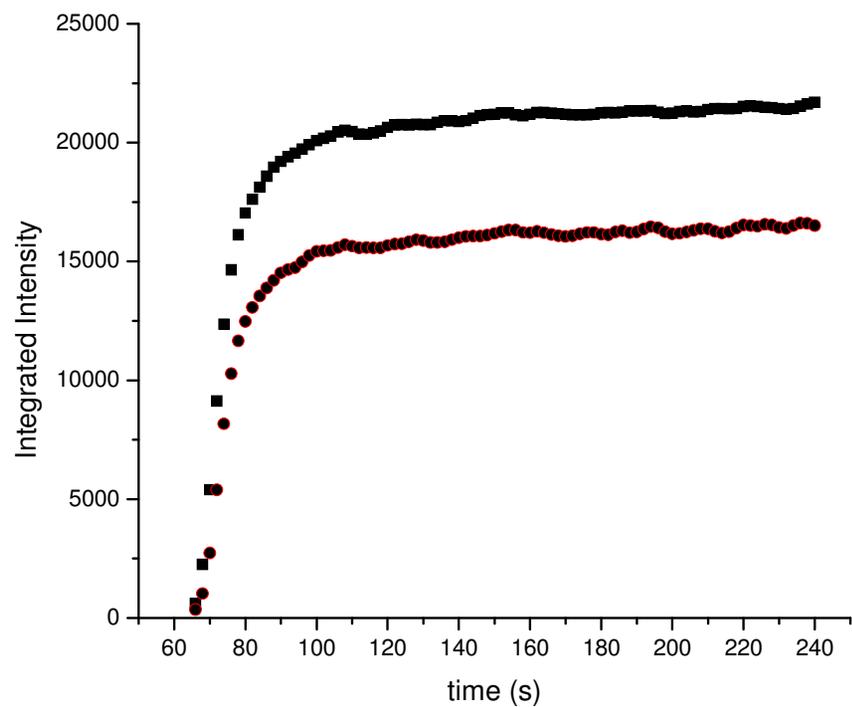


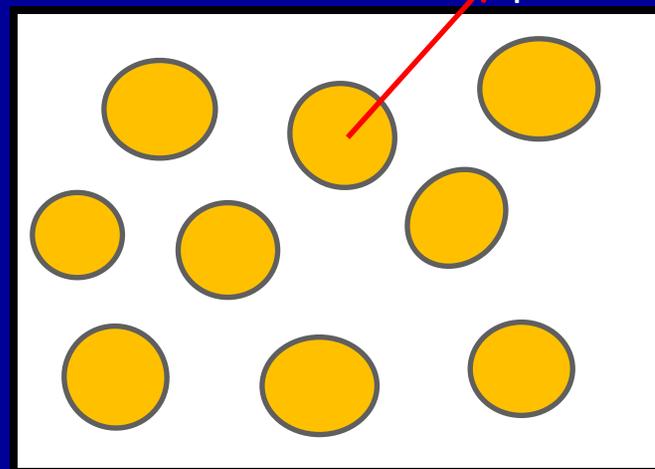
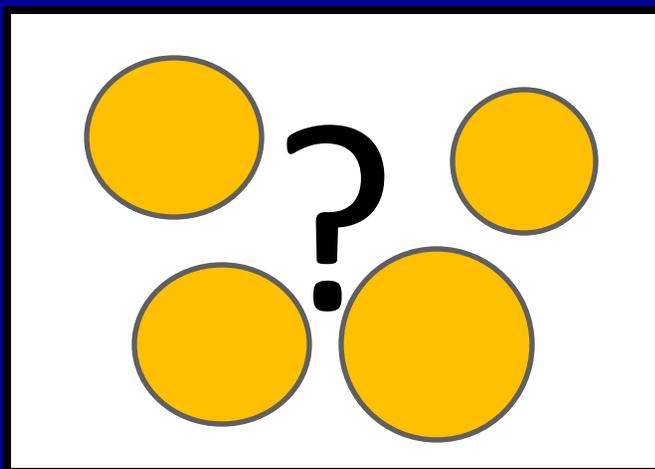
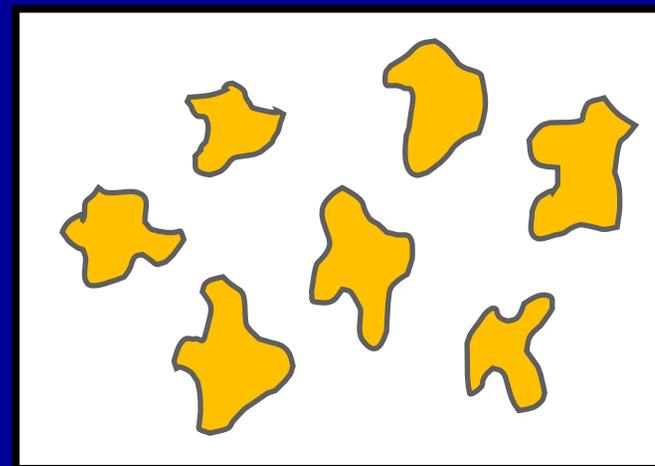
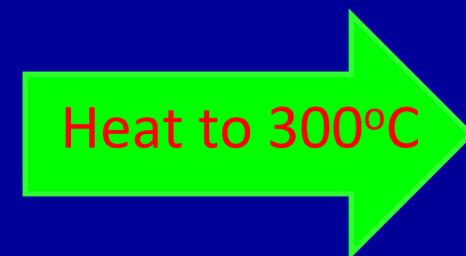
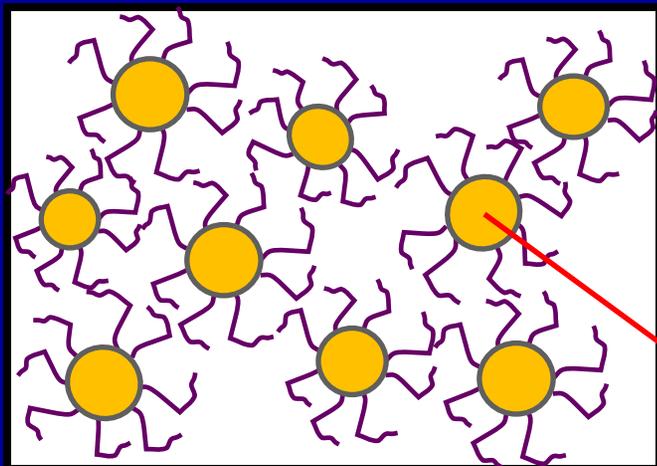
12 nm particles



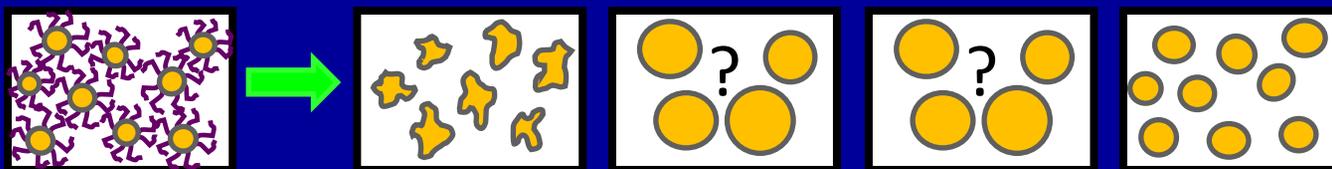
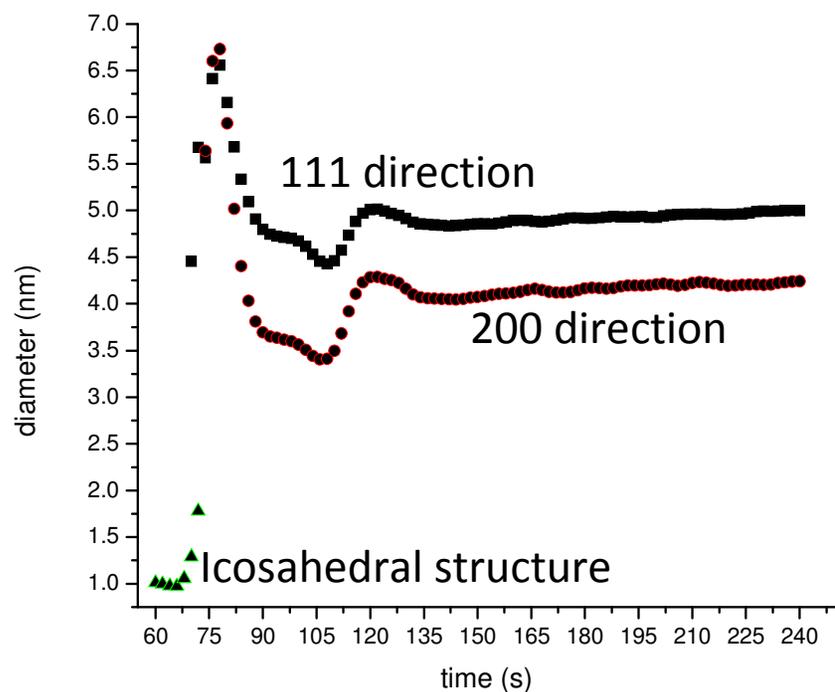
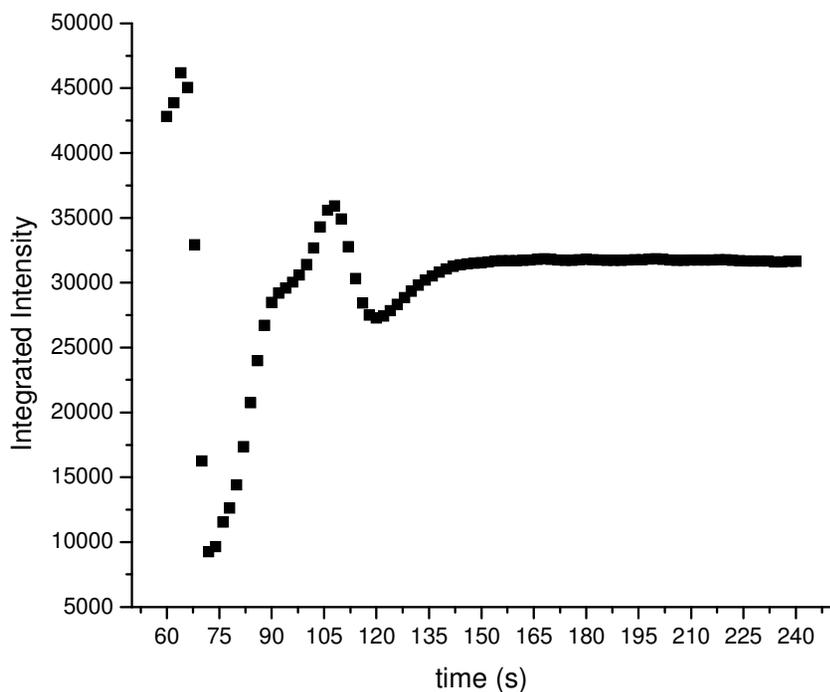
Gold/Platinum

Low Concentration 300°C

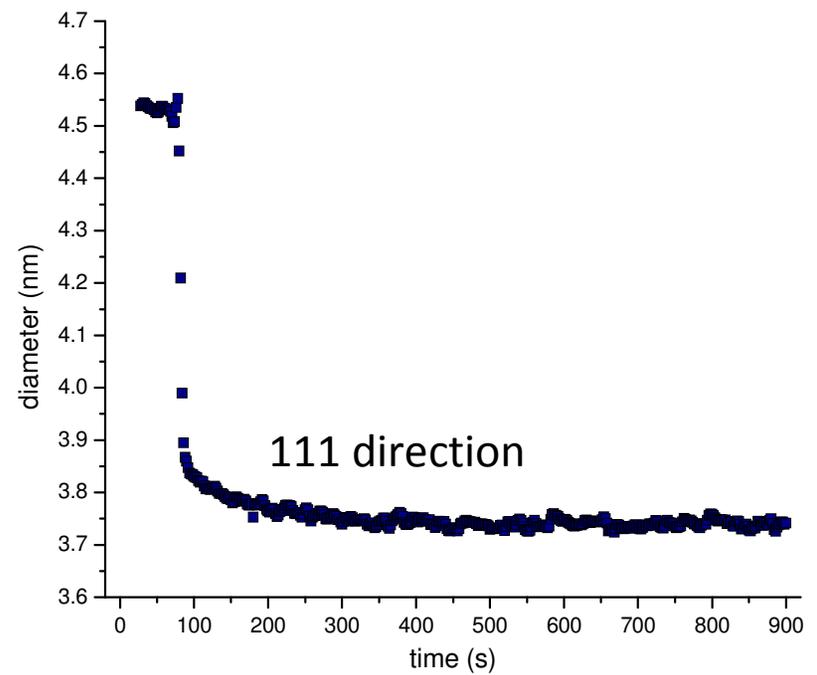
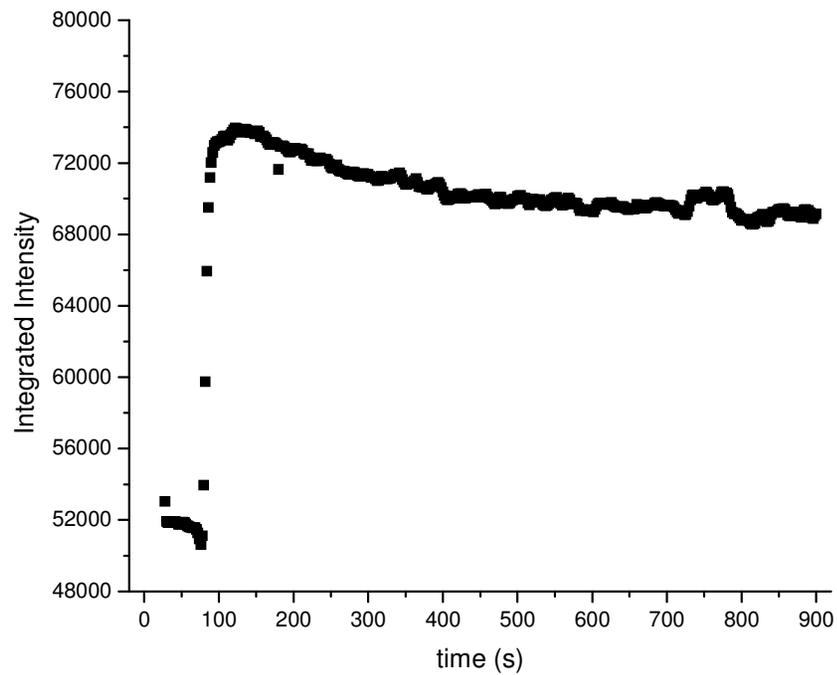


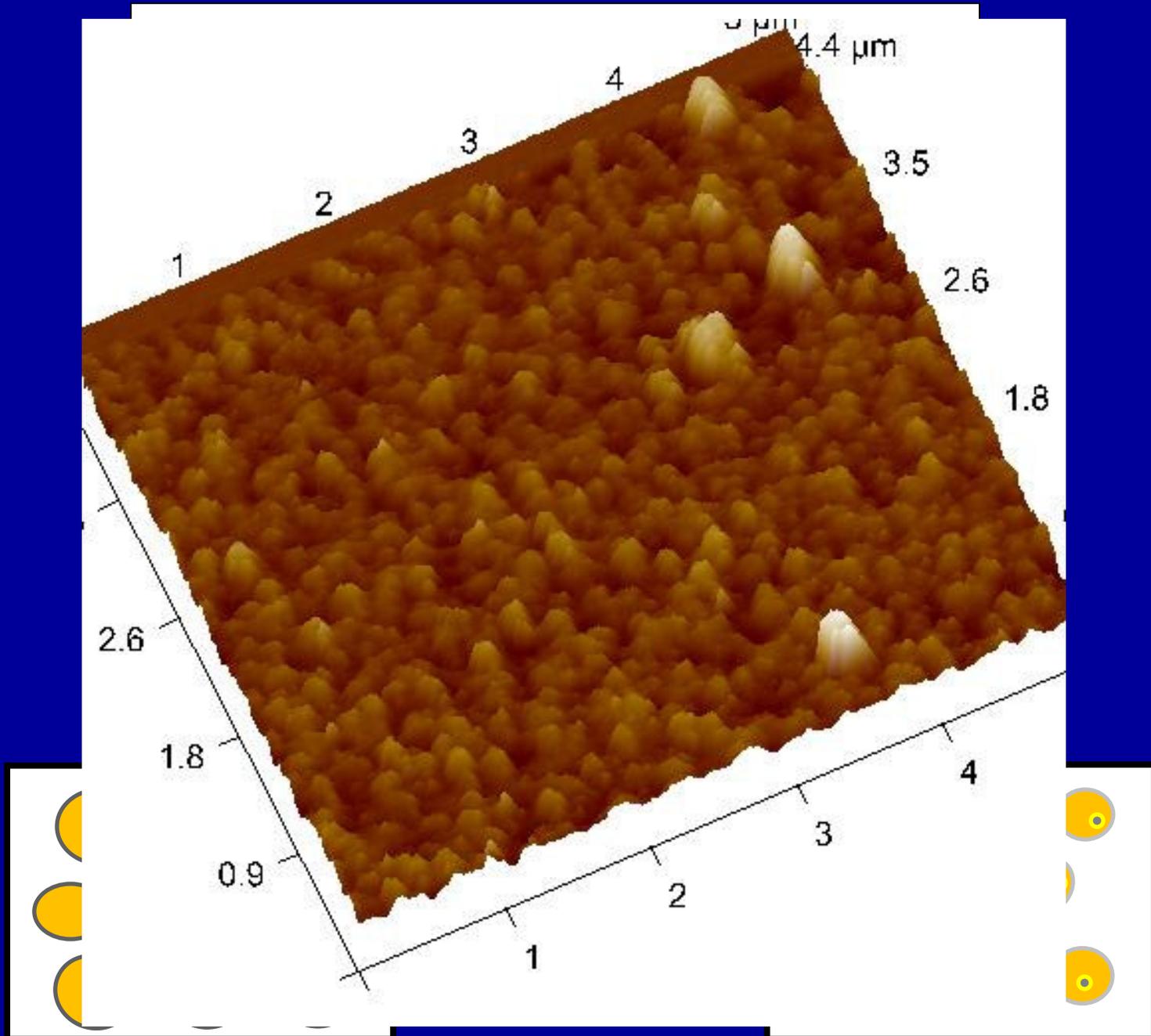


High Concentration 280°C

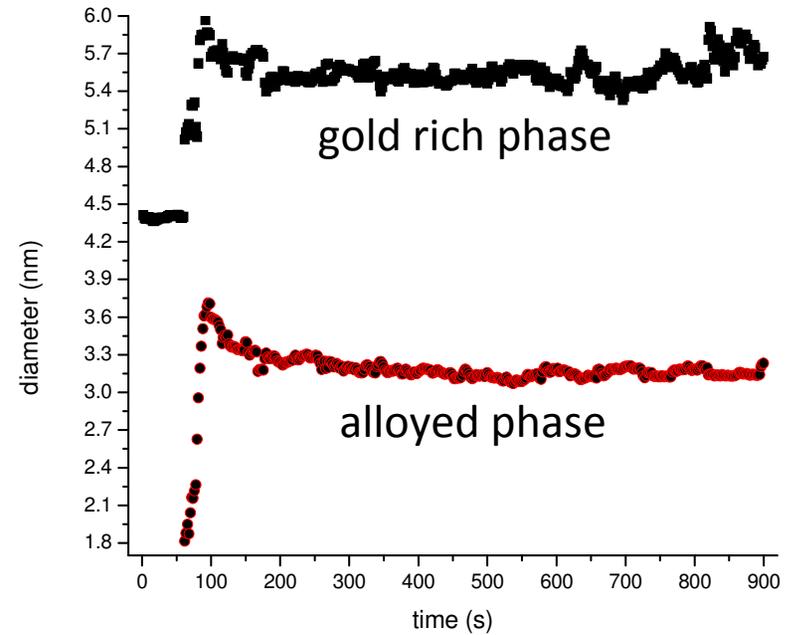
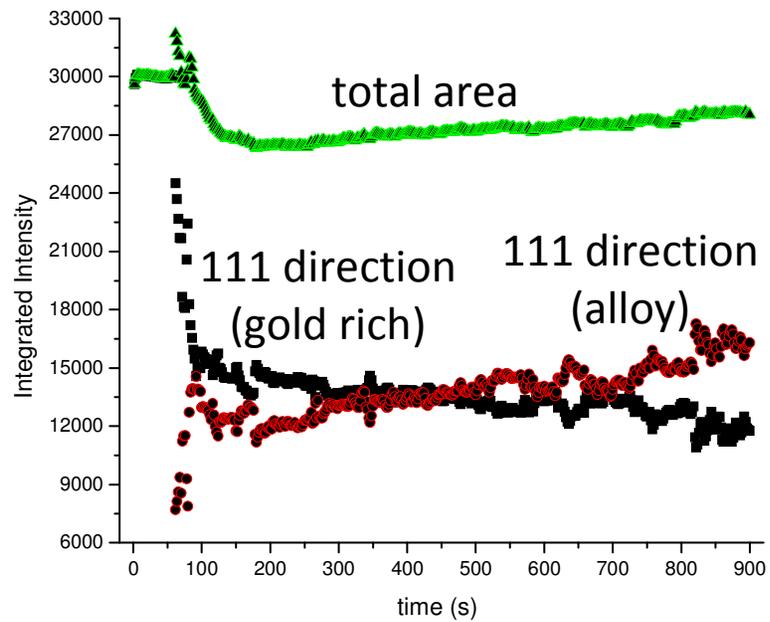


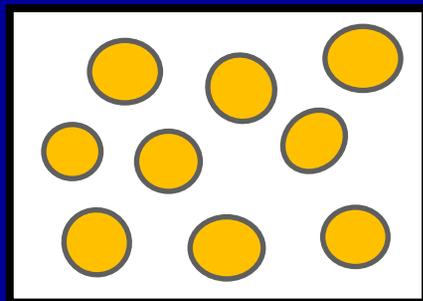
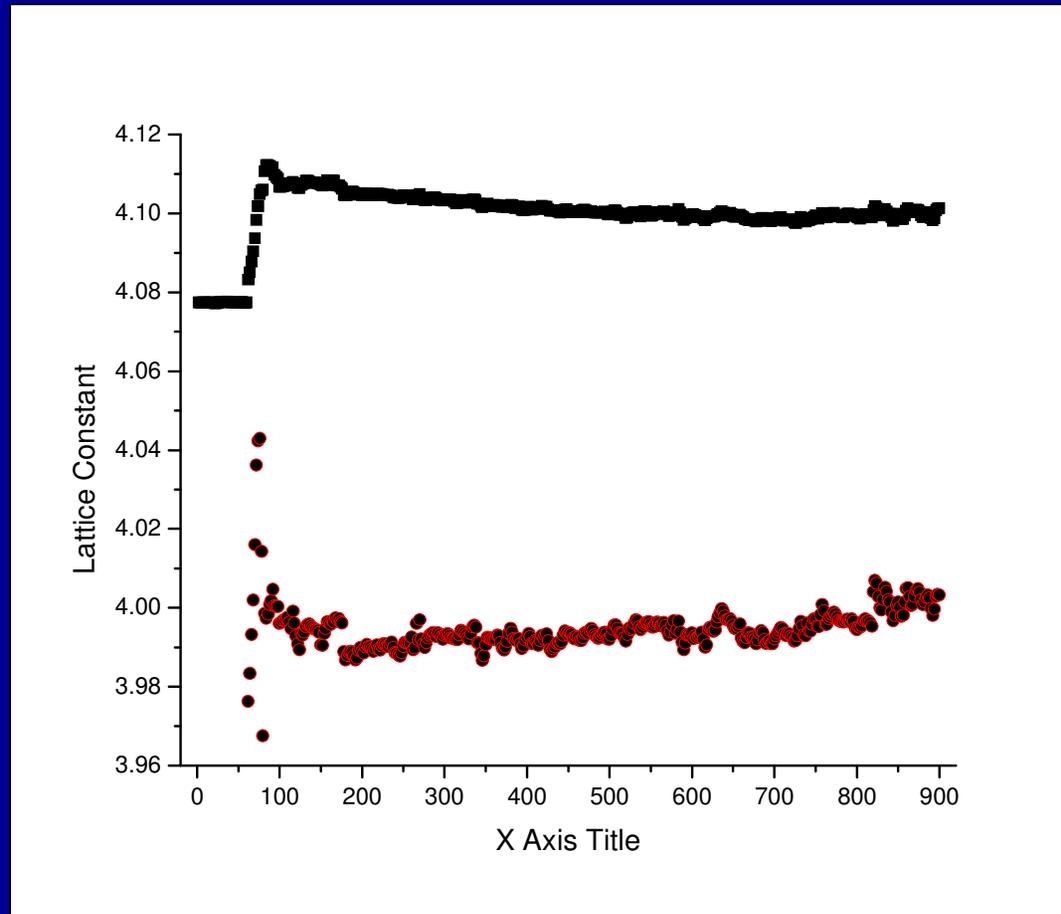
High Concentration 700°C



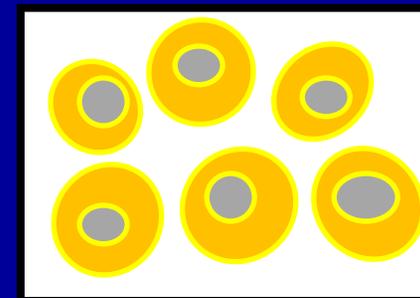


High Concentration 800°C





Heat to 800°C



Conclusions

- Nanoparticles are coarsening in heating process
- Au/ AuPt nanoparticles melt by $\sim 300^{\circ}\text{C}$
- Alloyed nanoparticles exhibit up/down behavior maybe explained by restructuring
- High temperatures required for phase segregation