

Control of shape in anisotropic gold nanoparticles

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The control of shape and size of anisotropic gold nanoparticles (NPs) was at the center of intense research in the last 20 years in regards to their unique physical and chemical properties. If control of size is nowadays achieved, the control of shape remains a difficult task. Questions about the mechanism promoting the anisotropy (in particular when considering the materials crystallizing in bulk in an FCC phase) are still under debate. In this context, the kinetic measurements of important characteristics during the formation of the nanoparticles are a solid support to unravel the mechanism. In our team, we have developed in situ methodologies to explore the transition towards anisotropic shape of gold nanoparticles in solution. The use of combined time resolved SAXS, X-ray absorption near edge structure (XANES) and UV-visible with HRTEM and SANS lead to extract some key points in the shape control (1-4). For the specific case of bipyramids (5), the key role of the initial structure of seeds in the orientation of the final shape have been determined through HRTEM analysis combined to a recent atomistic approach developed for metal-environment interactions to account for the stability of multi-twinned nanorods or bipyramids in a complex environment(6).

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