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Synthesis and Self-Assembly of Anisotropic Bimetallic Nanoparticles

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Abstract

Wet chemical synthesis is a very versatile method to obtain Au and Ag particles with an astonishing shape diversity, largely through the use of various additives, each of them fulfilling one or several roles. In this framework, I will focus on bimetallic Au/Ag nanoparticles, whose properties are rendered even more diverse by the combination of the two constituents. For instance, depositing Ag on pentatwinned Au bipyramids (AuBPs) is an efficient way to form Ag nanorods (AgNRs) with controllable aspect ratio which can be increased significantly upon controlled Ag addition, shifting LSPR from the visible to the infrared region. In a first work, we have shown an unexpected double role of ascorbic acid in this synthesis by using a combination of time resolved techniques.(1) AgNRs were prepared in which the gold bipyramid was located at the center of mass of the NPs. In a recent work, we developed a method in mixed solvent to break the symmetry of the AgNRs by displacing the seed position at one tip of the AgNR. We propose a mechanism to understand the Ag deposition on the gold surface which is supported by experimental evidence and molecular dynamic (MD) simulations. Finally, self-assembly directed by facet-facet alignment of such AgNR will be shown.

1. Aliyah K, Lyu J, Goldmann C, Bizien T, Hamon C, Alloyeau D, et al. *J. Phys. Chem. Lett.* 2020; 11(8):2830-7.