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Symmetry breaking in seed-mediated silver nanorod growth induced by dimethyl sulfoxide

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Engineering symmetry breaking in seed-mediated growth is a fundamental challenge to produce colloidal nanocrystals with controlled morphologies and properties.[1,2] In this work, we show a simple, aqueous approach to breaking the inversion symmetry of silver nanorods by restricting growth to one end of the pentatwinned gold bipyramid seed.[3] Controlled addition of dimethyl sulfoxide (DMSO) allows us to tune both the symmetry and the length and width of the objects. Simulations and experiments demonstrate the adsorption of DMSO, which displaces interfacial water, reduces binding of surfactant and chloride ions at the gold surface, and slows down the deposition kinetics of silver. Besides showing the potential of DMSO for controlling the synthesis of complex nanostructures, this work opens new perspectives for the study of the physical properties of non-centrosymmetric nanoparticles, e.g. by controlling their plasmon modes and their second-harmonic generation efficiency.

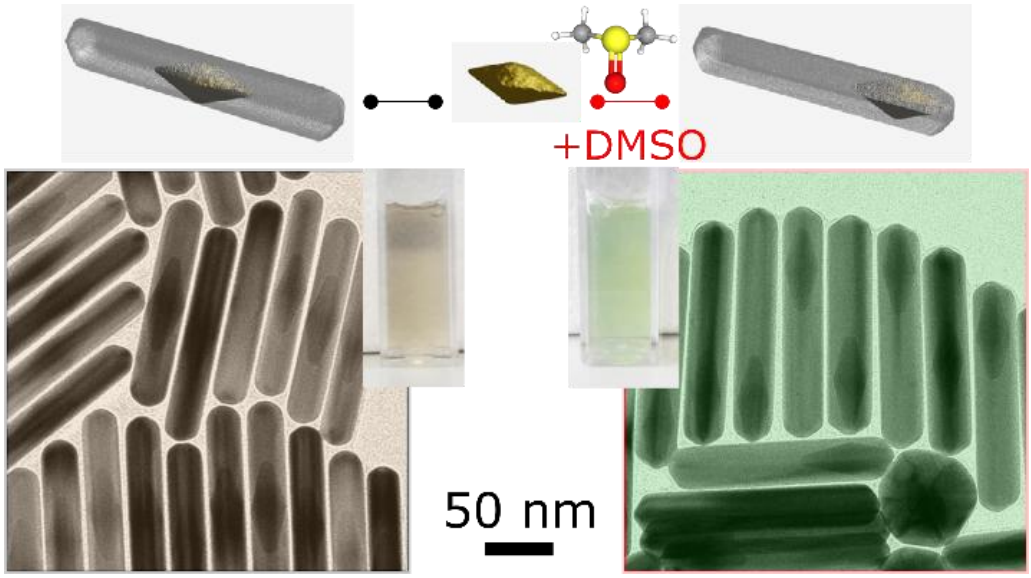

Figure 1: Asymmetric growth of Ag on Au bipyramids in mixed water/DMSO solvents.[3]

References:

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2. Sánchez-Iglesias, A.; Zhuo, X.; Albrecht, W.; Bals, S.; Liz-Marzán, L. M. *ACS Mater. Lett.* **2020**, 1246-1250.
3. Goldmann, C.; de Frutos, M; Hill, E.; Constantin, D.; Hamon, C., *Chem. Mater.* **2021**, *ASAP*