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Synthesis of metallic nanoparticles at the liquid/liquid interface in Ouzo type emulsions

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In this work, nano-objects composed of smaller metallic nanoparticles (NPs) are synthesized via an interfacial reaction in an Ouzo type emulsion. The Ouzo phenomenon happens when two miscible liquids are mixed together, but an impurity miscible in only one of the two liquids force phase separation. In our case, tetrahydrofuran (THF) and water are used with the presence of an impurity – butylated hydroxytoluene (BHT) – a stabilizer added to THF. We take advantage of this instantaneous emulsion for the interfacial redox synthesis of nanoparticles: a reducing agent is added to the aqueous phase (NaBH4) and a metallic precursor (AuPPh3Cl) is added to the organic phase (THF). Thus, when these liquids are mixed, THF droplets containing the precursor are formed in the aqueous phase containing the reducing agent, initiating the redox reaction. This leads to the in-situ formation of NPs at the THF/water interface, thanks to the reduction by NaBH4 of the metal precursor. Transmission electron microscopy (TEM) analysis (imaging and energy dispersive X-ray spectroscopy) revealed the formation of nano-objects formed by closely packed AuNPs, as seen in Figure 1a. Our synthesis benefits not only from its simplicity, but it also sports strong versatility thanks to its application to different metallic precursors (e.g. gold or palladium – Figure 1b) or even a mix thereof.

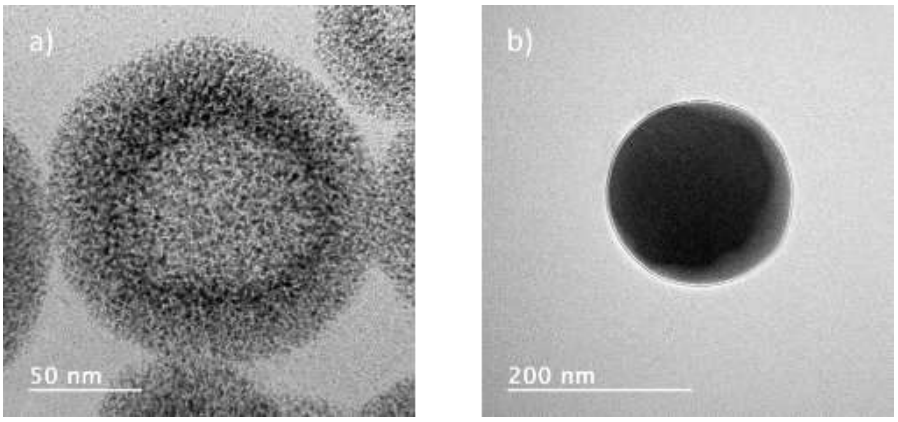

Figure 1 : TEM micrographs of spherical nano-objects synthesized via a gold (a) and palladium (b) precursor.

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