Seeded-growth method applied to the synthesis of large spherical and anisotropic gold nanoparticle dimers

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Bringing nanoparticles together in programmed stuctures has enabled the assembly of novel nanomaterials with unique physical and chemical properties.Theoretically dimers are the simplest type of assembly and many strategies are already available for their synthesis.[1-3] For gold nanoparticles (AuNPs) in particular the employment of DNA as a scaffold is exceptionally attractive and has been utilized to arrange nanoparticles into dimers, trimers or more complex structures.[4] Furthermore DNA sequences could be modified by adding clicking or anchor groups to ensure assembly stability.[5,6] However, this approach is not applicable to the formation of large spherical and anisotropic gold nanoparticle dimers. This is firstly due to the difficulty of separating large spherical AuNPs with a discrete number of short DNA strands and secondly the difficulty of functionalising anisotropic AuNPs with a discrete number of oligonucleotides.[7,8]

Here we show a seeded-growth method for the synthesis of dimers of either large spherical or anisotropic gold nanoparticles. Dimers of small particles are obtained through hybridisation of double stranded DNA and covalent linkage to the nanoparticles by click chemistry.[5] These dimer seeds then react with a gold salt precursor, reducing agent, and in some cases a surfactant. After purification, ligated dimers of larger particles or anisotropic nanoparticles are obtained (Figure.1).

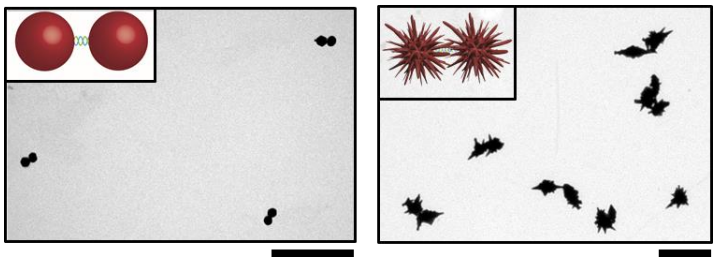

Fig. 1 TEM picture of grown a) spherical and b) branched DNA-AuNP dimers. Scale bars are 500 nm

The synthesis of the dimers and their purification could be studied using real-time extinction measurements.The use of the seeded method allows straightforward synthesis of complex types of gold nanoparticle dimers.

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