

Equipment Name: Nanoparticle Synthesis
Category:
A. Particle Synthesis
Institute: University College Dublin
Location: Centre for Bionano Interactions
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Short technology description/Overview:

Standard wet chemistry laboratory supplied with fumehoods, rotary evaporator, centrifugation apparatus, sonication equipment etc. In the near future will incorporate class III biosafety cabinets, fume hoods and glove box to GLP standards.

Experience in nanoparticle synthesis for a range of materials including - silica and silica composites, magnetite, polystyrene, thermo-responsive polymers, optically labelled variants of these (where the dyes do not leak under biological conditions) and surface functionalisation with PEG, proteins, antibodies etc.

Key research areas for nanoparticle synthesis include:

- Assessment and reduction of batch-to-batch variability in synthesis
- Optimising labelling efficiency and reduction of dye elution, including novel labelling strategies
- Optimising efficiency of targeting moieties, via novel functionalisation strategies.

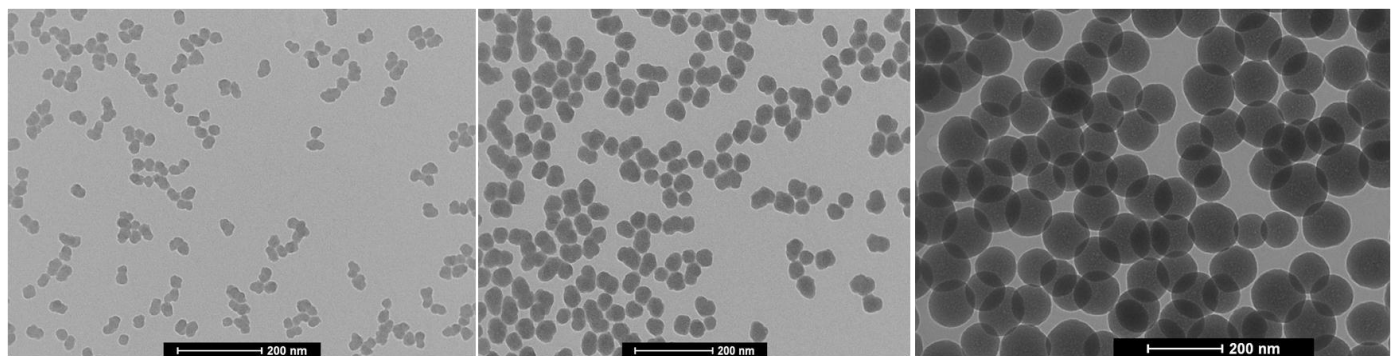
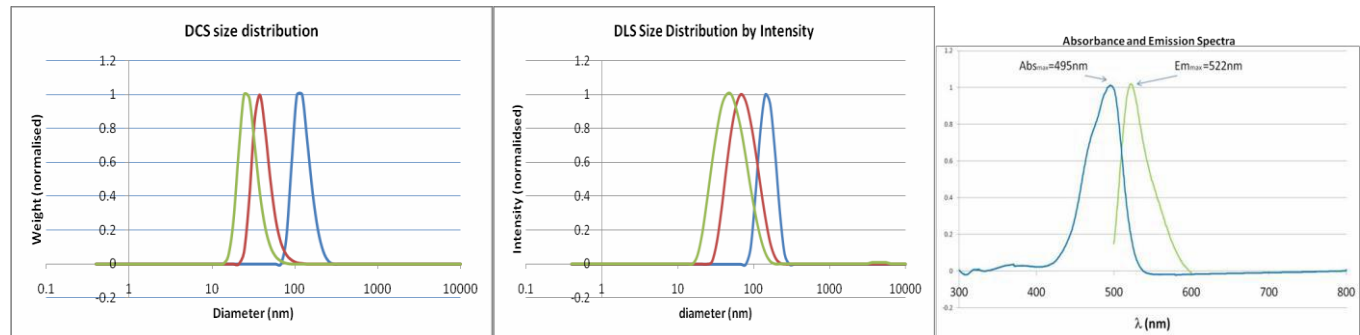
Nanoparticle characterisation facilities incorporate Dynamic Light Scattering (Malvern ZSNano), Differential Sedimentation Centrifuge (DCS technologies), Nanosight NTA for sizing, Fluorescence spectrometer (HORIBA Jobin Yvon FluroLog Spectrofluorometer) and 1D-Polyacrylamide gel electrophoresis and Gel doc imager for assessment of fluorescence dye release from labeled nanoparticles.

Main Features (Equipment Capabilities):

- Wet Synthesis Lab – synthesis, labelling, functionalisation and purification protocols for nanoparticles for biology
- Dispersion Analysis (DLS, DCS, TEM) for as produced particles, and bio-dispersions
- Spectrofluorimetric analysis for labelled particles
- Assessment of dye release profiles from labelled particles.

Typical Samples & Images:

Fluorescent Stöber silica nanoparticle aqueous dispersions 30,50 and 150nm:



Mahon E., unpublished results

Key publications:

- Tenuta T, Monopoli MP, Kim J, Salvati A, Dawson KA, Sandin P, Lynch I. Elution of Labile Fluorescent Dye from Nanoparticles during Biological Use. PLoS One. 2011;6(10):e25556. Epub 2011 Oct 6.
- Ramirez-Garcia S, Chen L, Morris MA, Dawson KA. A new methodology for studying nanoparticle interactions in biological systems: Dispersing titania in biocompatible media using chemical stabilisers. Nanoscale. 2011 Sep 30.
- Bouwmeester H, Lynch I, Marvin HJ, Dawson KA, Berges M, Braguer D, Byrne HJ, Casey A, Chambers G, Clift MJ, Elia G, Fernandes TF, Fjellsbø LB, Hatto P, Juillerat L, Klein C, Kreyling WG, Nickel C, Riediker M, Stone V. Minimal analytical characterization of engineered nanomaterials needed for hazard assessment in biological matrices. Nanotoxicology. 2011 Mar;5(1):1-11.

Any further Information:

Synthesis can be used in conjunction to physico-chemical characterisation techniques to assess the dispersion properties of the synthesised nanoparticles and with DCS to assess dispersion in biological fluids.