

Some Novel Uses and Properties of Nanoparticle Dispersions

Paul Luckham

Department of Chemical Engineering, Imperial College London, London, UK

Nanoparticles are interesting for all sorts of reasons, including but not limited to their high surface area to volume ratio, that they are not recognised as alien to the body; their novel electrical and optical properties, and their rheological properties.

In this talk I shall demonstrate some of these principles and show how novel supported catalyst can be prepared from mixed transition metal nano-particles, how microgel deswelling can be triggered by near infra red radiation; how nano-capsules can be prepared by using polymer latex particles as a template and finally reveal some intriguing rheological properties of nano silica dispersions in the presence of polyethylene oxide.

The catalyst nano-particles are comprised of a silica core and contain gold, platinum and palladium nanoparticles which are coated onto the silica particles using a modification of the layer by layer deposition technique. The microgel particles are based around poly-N-isopropylacrylamide, in which are incorporated gold nanoshells (particles of silica coated with a thin gold film). In these nanoshells the Plasmon resonance shifts to longer wavelengths enabling the nanoshells to absorb in the near infra red region. This is converted into heat energy causing the particles to heat. This local heating brings about the deswelling of the microgels.

The layer by layer method of polymer and particle adsorption is also used to prepare the nano-capsules, using polystyrene latex as a sacrificial core. However it has been found that to prepare mechanically robust capsules a layer of laponite significantly strengthens the capsules