

METAL NANOPARTICLES AS BUILDING BLOCKS FOR ADVANCED MATERIALS FABRICATION

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Metal nanoparticles have attracted great attention of scientific community due to their unique properties and new protocols are being explored not only to synthesize size and shape-controlled metal nanoparticles but also to explore the possible applications of these nanoparticles especially in the area of advanced materials fabrication and biotechnology. Recently we have reported a simple and reproducible protocol to prepare near monodispersed gold nanoparticles in the range of 1-4 nm, using polymeric stabilizers in aqueous system, which can then be transferred to organic solvents by capping them with alkanethiols¹. We have also reported the synthesis of monodisperse acrylate stabilized gold nanoparticles², which though are electrostatically stabilized, as do the classical citrate stabilized gold nanoparticles, but they are more stable under various reaction conditions which citrate stabilized gold nanoparticles can't withstand. So we presume that they might be better alternative of citrate stabilized gold nanoparticles for advanced materials fabrication. We have demonstrated this by using acrylate-stabilized gold nanoparticles as building blocks for the synthesis of emulsion templated highly porous gold beads³. This technique has now been extended to prepare emulsion templated Pd beads and can indeed be used to prepare a variety of inorganic materials. We have also developed a simple technique to produce inorganic oxides-metal nanoparticles composite materials using pre-made Au and Pd nanoparticles in which size and loading of metal nanoparticles can easily be controlled. We are also using high throughput screening approach to discover new nanomaterials and this approach has been quite successful for solution phase synthesis of gold nanowires and microporous nanospheres. A brief overview of our research projects involving synthesis and self assembly of metal nanoparticles to fabricate advance materials will be presented.

- 1: Hussain, I, S. Graham, Z. Wang, B. Tan, S. P. Rannard, D. C. Sherrington, A. I. Cooper and M. Brust. "Size-controlled synthesis near-monodisperse gold nanoparticles in the 1-4 nm range using polymeric stabilizers". *Journal of the American Chemical Society*, 2005, 127, 16398.
- 2: Hussain, I., A. Papworth, M. Brust and AI Cooper. Preparation of Acrylate-Stabilized Gold and Silver Hydrosols and Gold-Polymer Composite Films. *Langmuir*, 2003, 19, 4831.

- 3: Zhang HF, I. Hussain, M. Brust and AI Cooper. Emulsion templated gold beads using gold nanoparticles as building blocks. *Advanced Materials*, 2004, 16, 1, 27.