

Polymer-Layered Gold Nanoparticles: Preparation, Properties and Uses of a New Class of Materials

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Abstract : Immobilization of nano particles (NPs) is the subject of numerous studies pertaining to the design of polymer nano composites, supported catalysts, bioactive colloidal crystals, inverse opals for novel optical materials, latex templated-hollow inorganic capsules, immunodiagnostic assays; "Pickering" emulsion polymerization for making latex particles and film-forming composites or Janus particles; chemo- and biosensors, tunable plasmonic nano structures, hybrid porous monoliths for separation science and technology, biocidal polymer/metal nano particle composite coatings, and so on. Particularly, in the recent years, the literature has witnessed an impressive progress of investigations on polymer coatings, grafts and particles as supports for anchoring nano particles. This is actually due to several factors: polymer chains are flexible and may contain a variety of functional groups that are able to efficiently immobilize nano particles and their precursors by dispersive or van der Waals, electrostatic, hydrogen or covalent bonds. We review methods to prepare polymer-immobilized nano particles through a plethora of strategies in view of developing systems for separation, sensing, extraction and catalysis. The emphasis is on methods to provide (i) polymer brushes and grafts; (ii) monoliths and porous polymer systems; (iii) natural polymers and (iv) conjugated polymers as platforms for anchoring nano particles. The latter range from soft bio macromolecular species (proteins, DNA) to metallic, C60, semiconductor and oxide nano particles; they can be attached through electrostatic interactions or covalent bonding. It is very clear that physicochemical properties of polymers (e.g. sensing and separation) are enhanced by anchored nano particles, while polymers provide excellent platforms for dispersing nano particles for e.g. high catalytic performances. We thus anticipate that the synergetic role of polymeric supports and anchored particles will increasingly be exploited in view of designing unique hybrid systems with unprecedented properties.

Keywords : gold, layer, polymer, macromolecular

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