Surface Functionalization of Monodisperse Magnetic Nanoparticles

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***Abstract* – We present a systematic methodology to functionalize magnetic nanoparticles through surface-initiated atom-transfer radical polymerization (ATRP). The magnetite nanoparticles are prepared according to the method proposed by Sun et al. (2004), which leads to a monodisperse population of ~ 6 nm particles stabilized by oleic acid. The functionalization of the nanoparticles has been performed by transforming particles into macro-initiators for the ATRP, and to achieve this two different routes have been explored. The first one is the ligand-exchange method, which consists of replacing some oleic acid molecules adsorbed on the particle surface with molecules that act as an initiator for ATRP. The second method consists in using the addition reaction of bromine to the oleic acid double bond, which turns the oleic acid itself into an initiator for the ATRP. We have then grown polymer brushes of a variety of acrylic polymers on the particles, including polyisopropylacrylamide and polyacrylic acid. The nanoparticles so functionalized are water soluble and show responsive behavior: either temperature responsive behavior when polyisopropylacrylamide is grown from the surface or PH responsive in the case of polyacrylic acid. This methodology has potential applications in the control of clustering of magnetic nanoparticles.**