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pH AND TEMPERATURE-SENSITIVE MAGNETIC NANOPARTICLES

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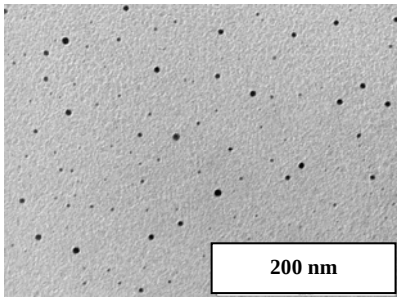
The research into magnetic nanoparticles is abundant due to their many potential industrial applications including drug delivery and recording media [1]. A major problem associated with magnetic fluids is the strong magnetic dipole-dipole attractions experienced by the particles result in agglomeration. It is therefore imperative to prevent the agglomeration via the use of electrostatic and steric stabilisers [2]. Polymers can act as steric stabilisers and present the opportunity to incorporate extra functionality into the core shell particle, such as sensitivity to pH and temperature. We have synthesised magnetic nanoparticles comprised of iron oxide that have a novel polymer grafted to the surface. Electron microscopy reveals that grafting the polymer to the surface of the nanoparticle prevents aggregation and leads to a high proportion of dispersed particles (Figure 1).

Figure 1 – Electron micrograph of the nanoparticles stabilized by the temperature and pH sensitive copolymer



The backbone of the copolymer is a graft copolymer of polymethacrylic acid and poly(ethylene glycol) PEG which was synthesised via ATRP. The polymer is pH sensitive and agglomerates in acidic conditions. In order to introduce a temperature sensitive element to the copolymer poly(N-isopropyl acrylamide) (NIPAM) has been grafted from the copolymer backbone. Above the lower critical solution temperature (LCST) of polyNIPAM the polymer will contract and below it will expand.

References

1. Tartaj, P., *The preparation of magnetic nanoparticles for applications in biomedicine.* J. Phys. D, Appl. Phys. 2003, **36**(13): R182-R197.
2. Wan, S., *Fe_3O_4 nanoparticles coated with homopolymers of glycerol mono(meth)acrylate and their block copolymers.* J. Mat. Chem. 2005, **15**(33): 3424-3430.

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