Polymerization Transformation of Oil in Water Magnetic Emulsion into Submicronic Magnetic Latexes

Franck Montagne[1], Sebastian Braconnot[1], Olivier Mondain-Monval [2], Christian PICHOT[1], Hamid ELAISSARI [1]

[1]CNRS-bioMérieux, ENS-Lyon, 46 allée d'Italie, 69364 Lyon, France.
[2]Centre de Recherche Paul Pascal - CNRS, avenue A. Schweitzer, 33600 Pessac, France.
Hamid.Elaissari@ENS-Lyon.fr

In the past decades, considerable attention has been paid to the preparation of magnetic latex particles for biomedical applications [1]. Indeed, these composites particles are commonly used in immunoassays as solid phase supports for the immobilization of biomolecules such as oligonucleotides, proteins or antibodies. The main advantage of colloidal magnetic particles is due to their separation upon applying an external magnetic field. Since the pioneering work reported by Ugelstad et al. [2], numerous efforts have been devoted to the synthesis of magnetic latexes.
The method reported here consists in the elaboration of new type of submicron functionalized magnetic latex particles from oil in water (o/w) magnetic emulsion [4] (i.e. organic ferrofluid droplets). At first, the seeded emulsion polymerization of ferrofluid droplets using styrene and AIBN initiator led to dissymmetric latex particles exhibiting a hemisphere like morphology. The phase separation was assigned to a thermodynamic incompatibility between the polystyrene phase and the internal phase of the magnetic droplets.

In order to solve this encapsulation problem, the influence of the polymerization process of ferrofluid droplets was then investigated. In fact, the final morphology of composite particles is usually strongly dependent on the used formulation and the polymerization conditions. Finally, submicronic magnetic latex particles exhibiting homogeneous core-shell morphology were obtained by using well appropriate polymerization recipe and conditions. The encapsulation of iron oxide was successfully achieved leading to latex particles exhibiting a magnetic core and a crosslinked polystyrene shell of about 20 nm.

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