Poly(ethyleneglycol-ε-caprolactone)@Fe3O4 Nanoparticles for Magnetic Resonance Imaging and Drug Delivery System

David Serrano-Ruiz, Jesús Ruiz-Cabello, Enrique López-Cabarcos, Jorge Rubio-Retama
Departamento de Química-Física II, Facultad de Farmacia, Universidad Complutense de Madrid, Spain

In this work we show the synthesis and characterization of Poly(ethyleneglycol-ε-caprolactone)@Fe3O4 microparticles that have been used as drug delivery system and contrast agent for Magnetic Resonance Imaging (MRI). The hybrid Poly(ethyleneglycol-ε-caprolactone)@Fe3O4 microparticles were based on Fe3O4 nanoparticles covered with a biodegradable and biocompatible poly(ethylene glycol-ε-caprolactone) shell. The synthesis of the hybrid material was carried out using ring opening polymerization technique of conveniently modified magnetic nanoparticles. The produced hybrid material was after that used to prepare magnetic Poly(ethylene glycol-ε-caprolactone)@Fe3O4 microparticles, see figure 1a.

In order to probe its suitability as drug delivery system, they were loaded with 17-α-Estradiol (a poorly water soluble drug) and its kinetic release was studied. Finally, with the aim of knowing the localization of this system within the animal, an aqueous colloidal dispersion of Poly(ethylene glycol-ε-caprolactone)@Fe3O4 microparticles was injected in rats and monitored by MRI.

Figure 1a. An image showing the magnetic behavior of the Poly(ethylene glycol-ε-caprolactone)@Fe3O4 microparticles dispersed in an aqueous solution. On the left, a TEM photograph of the system.