Core-shell magnetic-plasmonic nanoparticles enclosed in biocompatible hydrogels for multimodal cancer therapy

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The introduction of magnetic or metallic nanoparticles into hydrogels enhances their properties and applications into magnetic resonance imaging, biosensing, hyperthermia and as a template material [1]. Self-assembled biocompatible peptide-based hydrogelators have shown promising results as nanocarriers for antitumor drugs [2-5]. The combination of plasmonic and magnetic nanoparticles will synergistically enhance anticancer therapeutic strategies on the desired target through photothermia, magnetic hyperthermia, drug release and photodynamic therapy [1].

In this work, superparamagnetic manganese ferrite ($MnFe_2O_4$) nanoparticles either coated with a gold shell [6] or decorated with gold nanoparticles, were successfully incorporated into a new self-assembled peptide-derived hydrogel. The new magnetogels were tested as drug nanocarriers and photothermia capabilities were evaluated following the release of a model drug (curcumin).

Fluorescence-based techniques (fluorescence emission, FRET and fluorescence anisotropy) were used to assess hydrogelator physicochemical properties and incorporation of drugs in the magnetogels, drug transport towards model membranes and tuneable release upon plasmon excitation.

The developed magnetic/plasmonic nanosystems exhibited promising results for application in multimodal cancer therapy, combining chemotherapy and photothermia.

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