

Department of Materials Science - CENIMAT / I3N



Paula Soares

(PhD student)

Research Interests:

- Cancer theranostic (Drug delivery, Hyperthermia, MRI).

2012: Started a PhD on Nanotechnologies and Nanosciences.

2009: MSc. in Pharmaceutical Sciences from FFUL.

Multifunctional nanoparticles for osteosarcoma theranostic

CENIMAT/I3N and DCM- FCT/UNL:

- Microelectronic and Optoelectronic Materials Group
- Polymeric and Mesomorphic Materials Group



FACULDADE DE
CIÊNCIAS E TECNOLOGIA
UNIVERSIDADE NOVA DE LISBOA



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Objectives

The main goal of the present PhD. Thesis is to obtain chitosan-based multifunctional nanoparticles (MNPs) for osteosarcoma treatment and monitoring (contrast agents for targeted MRI). It's expected that these highly specific nanoparticles promote specifically tumor cell death, allowing in a single platform to perform diagnosis and treatment (and its monitoring through MRI).

The therapeutic effectiveness of MNPs proposed is achieved by: 1) specificity for osteosarcoma, due to the use of mAb specific for CA IX, 2) use of a promising new drug (Ladirubicin), whose efficiency was observed in other cases of resistance to common anti-cancer drugs, 3) death of cancer cells by hyperthermia and chemotherapy.

Methodology

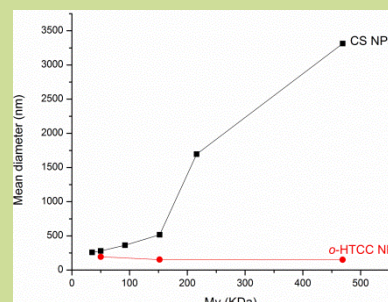
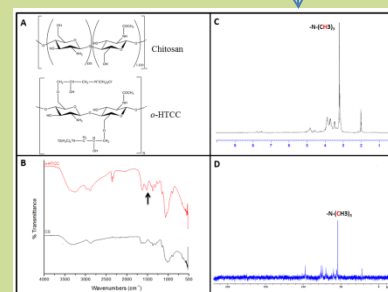
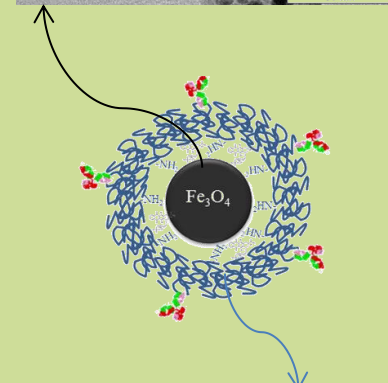
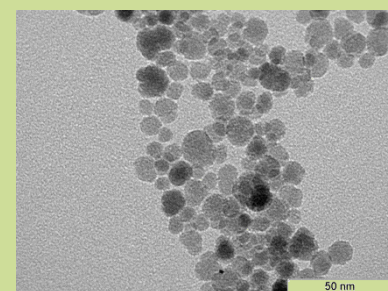
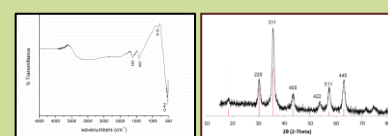
For the development of these multifunctional nanoparticles, several tasks must be completed:

- Task 1 – Production and physicochemical characterization of composite magnetic nanoparticles (CNPs)
- Task 2 – Characterization of CNPs magnetic properties
- Task 3 – In vitro evaluation of CNPs cytotoxicity and drug release studies
- Task 4 – Hyperthermia measurements
- Task 5 – Production of monoclonal antibodies with specificity to CA IX
- Task 6 – MNPs production and in vitro assay for its capacity to lyse osteosarcoma cell line
- Task 7 - In vivo biodistribution evaluation of MNPs anti tumoral activity evaluation

Expected Results

This project aims for the production of multifunctional nanoparticles for cancer theranostic. Some of the above-cited tasks were already started:

- The production and physicochemical characterization of the magnetic nanoparticles was performed by chemical precipitation and thermal decomposition. The obtained nanoparticles were characterized by DRX and FTIR, confirming the presence of Fe_3O_4 , and TEM, confirming the presence of monodispersed nanoparticles with a mean diameter of 10-15nm.
- Synthesis of the chitosan derivative was performed successfully, what was confirmed by FTIR, 1H -RMN and ^{13}C -RMN.
- Nanoparticles of chitosan and its derivative were made, demonstrating that the chitosan derivative its more advantageous than chitosan itself.



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