

MAP-fis Essay Proposal, 2015-2016

(please write in English)

Supervisor

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Title *Magnetic liposomes based on calcium and magnesium ferrite nanoparticles as nanocarriers for antitumor drugs*

Area

(Materials, Optics, Condensed Theory, High Energy Theory,....);

Biophysics; Nanomaterials

Summary of Proposal

In this work, magnetoliposomes (liposomes entrapping magnetic nanoparticles) will be developed as nanocarriers for antitumor drugs.

These systems will be based on magnetic nanoparticles of calcium ferrite, magnesium ferrite and mixed calcium/magnesium ferrites that will be prepared and characterized, with the determination of optical, structural (XRD, SEM and HR-TEM) and magnetic properties of the prepared nanoparticles.

Both aqueous and solid magnetoliposomes based on the prepared nanoparticles will be developed. Coupling of the nanoparticles with moderate to long alkyl chain organic molecules will improve the interaction with the lipid layer(s) in magnetoliposomes.

The structural characterization of the magnetoliposomes will be performed by DLS, SEM and HR-TEM, and their magnetic properties will be evaluated by SQUID (through on-going collaborations).

Fluorescent antitumor drugs will be incorporated in magnetoliposomes and their photophysical behavior will be evaluated. Investigation of the location of the drugs in magnetoliposomes will be performed by fluorescence anisotropy measurements and Förster Resonance Energy Transfer (FRET) from the drugs to fluorescent-labeled lipids included in the magnetoliposomes.

The interactions of magnetoliposomes with models of cell membranes (Giant Unilamellar Vesicles, GUVs) will also be investigated by FRET. PEGylation and inclusion of folate in the magnetoliposome formulations will increase the delivery efficiency of drugs into cells through folate receptors.

The global objective is to develop new nanosystems for cancer therapy in a synergistic approach,

combining the delivery of antitumor drugs with the hyperthermia capabilities of the magnetic nanoparticles included in magnetoliposomes.

References

(to allow students first look at topic)

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