MAP-fis Essay Proposal, 2015-2016

(*please write in English*)

Supervisor

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Title

High-aspect-ratio magnetic nanoparticles as a multimodal nanocarriers for cancer therapies

Area

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

Materials

Summary of Proposal

Cancer is a leading cause of death worldwide. The current cancer therapies are commonly associated with undesirable side effects, due to their cytotoxic and poor tumor targeting. A major advance in drug-delivery could be achieved if drug-carrying presents an efficient dual triggering: treatment and transport/release of the drug. In this context, nanocarriers can be used for target drug delivery and combined with hyperthermia can thereby improve the therapeutic index of the treatment [1, 2]. To improve the treatment efficiency a magnetic core can be encapsulated inside a biocompatible nanoparticle to perform hyperthermia. Beyond the use of the classic spherical nanoparticles, the novel and promising high-aspect-ratio nanoparticles synthetized by template assisted nanofabrication can be employed in order to become the magnetic core [3, 4].

This essay proposal targets a review of the fabrication methods of high-aspect-ratio nanoparticles synthetized by template assisted nanofabrication for biomedical applications, with main focus on the electrodeposition in porous templates and its optimization for achieve highly organized arrays of nanowires.

References

(*to allow students first look at topic*)

[1] K.D. Tew & P.B. Fisher, Advances in Cancer Research, (2013) v118, Cap. 1, Elsevier, USA.

[2] G.F. Ismael, D.D. Rosa, M.S. Mano and A. Awada, Novel cytotoxic drugs: old challenges, new solutions, Cancer Treat Rev, 34 (2008) 81-91.

[3] Y. Geng, P. Dalhaimer, S. Cai, R. Tsai, M. Tewari, T. Minko and D.E. Discher, Shape effects of filaments versus spherical particles in flow and drug delivery, Nature Nanotechnology, 2 (2007) 249.

[4] L. Asin, M. R. Ibarra, A.Tres, and G.F. Goya, Controlled Cell Death by Magnetic Hyperthermia: Effects of Exposure Time, Field Amplitude, and Nanoparticle Concentration, Pharmaceutical Research, 29 (2012) 1319-1327