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Fabrication of FePt Nanowires through Pulsed Electrodeposition into Nanoporous Alumina Templates

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According to the World Cancer Report, cancer is the second leading cause of death worldwide, having been responsible for one-sixth of the deaths globally in 2018 [1–3]. Currently, there exist various oncologic therapeutic approaches, the main ones being surgery, radiotherapy, and chemotherapy [4,5]. However, these are often associated with undesirable side effects, since they do not only kill tumor cells but also affect normal cells in the human body, causing, therefore, unwanted damages to healthy tissues [6]. Consequently, an interest has arisen for developing novel efficient therapies with fewer side effects [7].

In this line of research, a relevant approach involves the targeted delivery of anticancer drugs through the use of biocompatible nanocarriers presenting a dual triggering: treatment and transport/release of the drug at the target tumor site. This work appears in such context. Particularly, we are developing a novel multimodal generation of targeted nanocarriers, loaded with anticancer drugs and capable of exerting a magneto-mechanical action through a magnetic core. Beyond classic magnetic spherical nanoparticles, we are also interested in fabricating nanostructures with unique spin configurations, via template-assisted nanofabrication and lithography, for this application. Additionally, lipid nanoparticles will be used as a shell due to their biocompatibility, surface properties, high drug payload, and reduced absorption via the lymphatic system, which improves drug bioavailability.

Here, we will present the synthesis approaches to obtain FePt nanowires and Au/Fe/Au multilayered nanodiscs [8]. These last nanostructures were employed in macrophage cell assays with and without PEG functionalization, having been observed that they possess an adequate biocompatibility. Furthermore, it was verified a significant reduction of the nanoarchitectures uptake by the macrophages when they were functionalized with PEG.

Primary author: Mr MAGALHÃES, Ricardo (IFIMUP and DFA, Faculdade de Ciências da Universidade do Porto, 4169 Porto, Rua do Campo Alegre 1021/1055, Portugal)

Co-authors: Ms CASPANI, Sofia (IFIMUP and DFA, Faculdade de Ciências da Universidade do Porto, 4169 Porto, Rua do Campo Alegre 1021/1055, Portugal); Dr NAVAS, David (IFIMUP and DFA, Faculdade de Ciências da Universidade do Porto, 4169 Porto, Rua do Campo Alegre 1021/1055, Portugal); Dr PROENÇA, Mariana P. (ISOM, Universidad Politécnica de Madrid, Avda. Complutense 30, E-28040 Madrid, Spain); Dr REDONDO, Carol (Dpto. de Química-Física, Universidad del País Vasco UPV/EHU, 48940 Leioa, Spain); Prof. MORALES, Rafael (Dpto. de Química-Física & BCMaterials, Universidad del País Vasco UPV/EHU, 48940 Leioa, Spain; IKERBASQUE, Basque Foundation for Science, 48011 Bilbao, Spain); Dr LIMA, Sofia (LAQV, REQUIMTE, Faculty of Pharmacy of Porto University, Portugal); Prof. REIS, Salette (LAQV, REQUIMTE, Faculty of Pharmacy of Porto University, Portugal); Prof. ARAÚJO, João P. (IFIMUP and DFA, Faculdade de Ciências da Universidade do Porto, 4169 Porto, Rua do Campo Alegre 1021/1055, Portugal); Prof. PEREIRA, André M. (IFIMUP and DFA, Faculdade de Ciências da Universidade do Porto, 4169 Porto, Rua do Campo Alegre 1021/1055, Portugal); Dr NUNES, Cláudia (LAQV, REQUIMTE, Faculty of Pharmacy of Porto University, Portugal); Dr SOUSA, Célia T. (IFIMUP and DFA, Faculdade de Ciências da Universidade do Porto, 4169 Porto, Rua do Campo Alegre 1021/1055, Portugal)

Presenter: Mr MAGALHÃES, Ricardo (IFIMUP and DFA, Faculdade de Ciências da Universidade do Porto, 4169 Porto, Rua do Campo Alegre 1021/1055, Portugal)

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