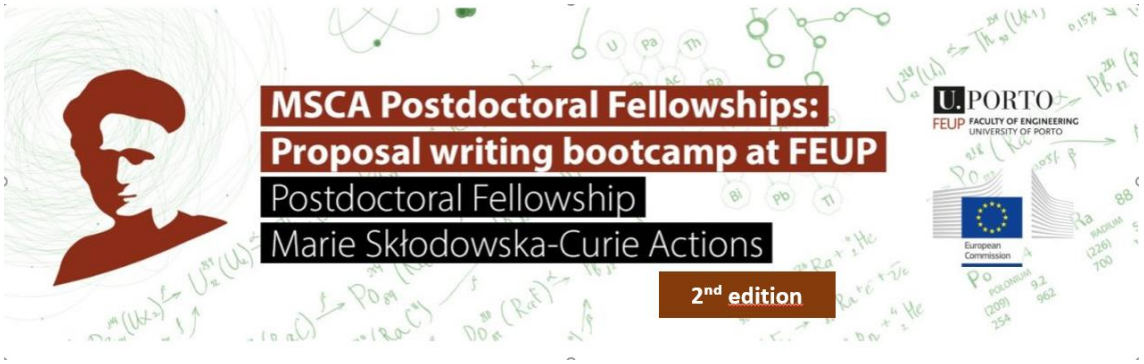


SUPERVISOR INFORMATION	
First and Last name	Artur Pinto
URL of supervisor webpage	https://www.cienciavitae.pt/portal/401D-0E04-9633
Department	Chemical Engineering
Field(s) of research	Bioengineering; Chemical Engineering
PROJECT PROPOSAL	
Title (optional)	PowerBotPills: New Pills for Magnetic Hyperthermia combined with Photothermal Therapy of Gastric cancer

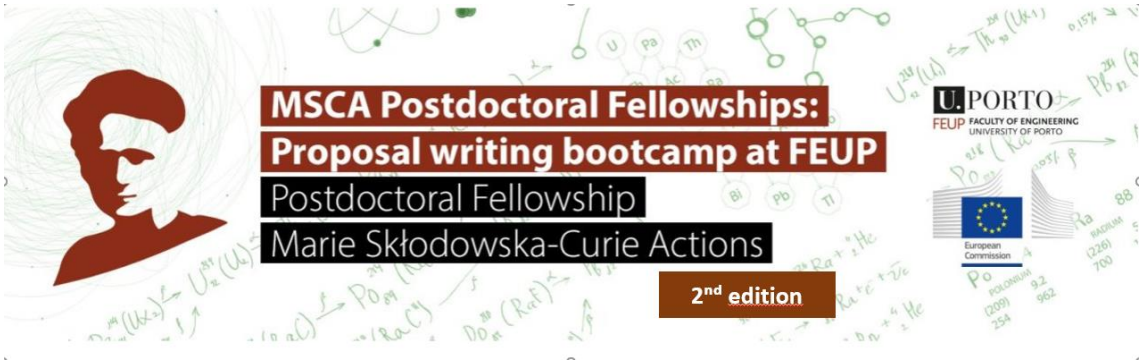
Brief project description

Gastric cancer is one of the most lethal malignant tumors, with a 5-year survival rate <20%. Generally, due to its high aggressiveness and heterogeneity, gastric cancer remains a severe global health problem. One in every 3 patients with potentially curable gastric cancer do not undergo resection, due to patient refusal, worse performance status, comorbidity, and extent of disease. Therefore, there is a need to develop more selective and less aggressive treatment strategies for gastric cancer.

Alternative treatment modalities such as photothermal therapy (PTT), based on nanoparticle systems still require improvements, such as control over selective heating of tumor cells/area or enhancement of drug loading capacity and fine control over drug release and mate rials penetration in the tumor in a targeted manner. The design of multifunctional nanomedicines that could be used for synergistic multimodal treatment is still a new challenging field that requires the development/discovery of new materials/methods and tuning their properties for medical devices. The development of new devices adequate to newly developed nanoparticles is also paramount. Biocompatibility and biodegradation of most currently available nanoparticles are still debatable, which also presses the need for further study and search of alternative materials.

PowerBotPills intends to develop 2D-nanomaterials (2DnMat) for gastric cancer selective chemotherapy + hyperthermia therapy, focusing on both existing 2DnMat with added magnetic features and on using inherently magnetic 2DnMat.

Bringing together 3 multidisciplinary institutions and teams (FEUP, i3S, UTAD), this project will produce new data on newly isolated 2DnMat optimization, effectiveness, biocompatibility, and safety for uses in drug delivery and cancer therapy. FEUP and i3S have been working jointly for



>14 years on the topic and UTAD joined the team >4 years ago. Therefore, most methods are implemented, and preliminary results demonstrate the feasibility of the proposed work plan.

Presently, studies in the phototherapy field focus on cancer cell eradication using high power lasers which cause tissue necrosis, therefore not being selective and damaging healthy tissues. To achieve a selective treatment with light sources as simple, light and cheap as LEDs would open a new page on cancer phototherapy, placing it as a selective, safe and versatile system, affordable and easy to implement anywhere around the globe (aligned with UN2030 Goal 3, and EU Beating Cancer Plan).

All relevant results will be patented and translation to clinics and industry debated together with our hospital, industrial contacts, and consultants.