

PhD fellow in: Magnetic Materials For Treating Cancer

IIT invites excellent candidates to apply to its PhD program organized in collaboration with the Open University; this international PhD program confers Doctorates in *Health, Sustainable and Human Technologies*.

In order to be admitted into the ARC program, the minimum requirements are

- i. a Masters-level degree, which broadly corresponds to a 4/5-year undergraduate MSc/MChem/Meng-style degree or to a postgraduate Masters in the British system, or to a second level University degree in Italy;
- ii. a grade corresponding to an upper second class (2.1) or a merit in the UK system or 100/110 in the Italian system. Candidates with lower grades but redeeming features (publications, specific expertise) are requested to contact the potential supervisors before applying;
- iii. where English is not the applicant's first language, a valid IELTS (International English Language Testing System) certificate. The minimum acceptable score is an overall 6.5, with no less than 6.0 in any of the four categories

One PhD fellow position **will be available from April 1st 2024** in the [Nanomaterials for Biomedical Applications](#) led by Dr. [Teresa Pellegrino](#).

Title of the project: Scalable synthesis of magnetic-inorganic nanomaterials for biomedical applications.

Background: The use of magnetic nanoparticles in various biomedical applications is gaining momentum thanks to the multifunctional properties of these peculiar nanomaterials. Among them, the use of magnetic nanoparticles as heat mediators in magnetic hyperthermia represents a new form of cancer therapy now in clinical trials for the treatment of Glioblastoma Multiforme and prostate tumors. With this method, tumor cells are burnt by increasing the temperature at the therapeutic range of 43-46°C generated by magnetic nanoparticles when exposed to a time-varying field (a radiofrequency in the kHz regime). For this application, it is crucial to maximize the heating efficiency of magnetic nanoparticles under a kHz-radiofrequency of clinical use and intratumoral conditions. Also, the combination of magnetic hyperthermia with other therapeutic approaches can create synergic toxic effects towards tumor cells enabling to further reduce the dose of magnetic materials.

Description: The PhD project aims to develop synthetic procedures for magnetic-inorganic nanoparticles designed for combining magnetic hyperthermia with other therapeutic approaches using microfluidics systems and microwave/assisted methods. The PhD student will aim at tuning synthesis conditions to obtain magnetic-inorganic materials at controlled composition, size, shape, and crystallinity of the multi-domain heterostructures. Accurate physical/chemical studies will be carried out to correlate the magnetic /structural parameters to the magnetic hyperthermia heat efficiency not only in aqueous media but also under conditions that simulate the tumour microenvironment. The candidate will also aim to use Deep Learning/Machine learning techniques to optimize the synthesis, predict results, and analyze data. The ideal candidate should be able to develop his/her own ideas on the present topics while having a well-defined attitude to collaborate within an international and interdisciplinary team.

Main Supervisor: [Teresa Pellegrino](#) ([Nanomaterials for Biomedical Applications](#))

Essential expertise:

- i. A Master degree in Chemistry or cognate discipline
- ii. Previous experience in the synthesis of magnetic nanoparticles and their manipulation.
- iii. Experience in structural characterization of nanomaterials, such as Transmission Electron Microscopy (TEM), X-ray diffraction (XRD), etc
- iv. Knowledge on co-precipitation, solvothermal, thermal decomposition and microwave-assisted synthesis methods

- v. Experience in calorimetric measurements and data processing for Specific Absorption Rate (SAR) determination, high frequency hysteresis measurements, etc.

Desirable expertise:

- i. Experience with high pressure systems
- ii. Knowledge of water transfer protocols for nanoparticles
- iii. Synthesis of polymers and their use for simple ligand exchange protocols
- iv. Any further characterization techniques needed for the characterization of nanomaterials (gel electrophoresis, dynamic light scattering measurements, thermo-gravimetric analysis, elemental analysis, etc.)
- v. Chemical engineering and mathematical simulation skills

How to apply. Prospective students must submit using the online form the following documents

- 1) 2-page CV, which includes studies, expertise and achievements.
- 2) 1-page research statement, which includes the choice of a project from the list above and a justification of the choice. Only if robustly justified, the student may signal their interest also for a second project, but there is no guarantee that this will be taken into account by the selection panel.
- 3) A transcript of undergraduate and postgraduate studies.
- 4) A valid IELTS certificate, obtained no more than two years before the proposed registration date.
- 5) Contact details of two referees.

Deadline for application: January 28th 2024

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Istituto Italiano di Tecnologia is an Equal Opportunity Employer that actively seeks diversity in the workforce.

Please note that the data that you provide will be used exclusively for the purpose of professional profiles' evaluation and selection, and in order to meet the requirements of Istituto Italiano di Tecnologia. Your data will be processed by Istituto Italiano di Tecnologia, based in Genoa, Via Morego 30, acting as Data Controller, in compliance with the rules on protection of personal data, including those related to data security.