Optimization of solid targets and development of new liquid targets for the production of unconventional radioisotopes for nuclear medicine

Selected research theme

Physics and chemistry related to the production of innovative radioisotopes for nuclear medicine with the ARRONAX cyclotron.

Goal

GIP ARRONAX [1], acronym for Accelerator for Research in Radiochemistry and Oncology at Nantes Atlantique, it is an accelerator which allows to accelerate protons, deuterons and alpha particles to produce innovative radioisotopes for nuclear medicine. GIP ARRONAX is based in Nantes, France.

The subject of thesis proposed is dedicated to targeting and mainly to the achievement of targets that will be irradiated to produce innovative radionuclides for which no commercial solution exists. The target used can be either solid or liquid. A solid target is obtained by the electroplating technique. This latter allows to produce homogeneous, compact and controlled thickness layers for many materials. And a liquid target is obtained by mixing in a container a solution of nitric acid and the metal salt dissolved in this one. This salt is selected beforehand to produce the radioisotope of interest.

The thesis will focus on 3 projects: the production of terbium 149 and copper 67 which are used for radiotherapy and the production of gallium 68 for medical imaging.

The expected results are, besides the concrete realization of the targets answering the constraints fixed by the production, the research on the understanding of the electrochemical system of the species in solution in order to optimize the electroplating parameters and on the understanding of the chemical reaction between the dissolved material in the solution and the protons accelerated by the ARRONAX cyclotron in order to optimize the production of the radioisotope of interest from a liquid target.
**Place of the thesis**

The future doctoral student will work on GIP ARRONAX in Nantes, France, and his main supervisor is Thomas Sounalet. 2 co-supervisors are planned including Nathalie Michel and Cyrille Alliot and the thesis director is Ferid Haddad. The duration of the thesis is planned for 3 years and the thesis is financed by the funding agency of the doctoral school of the University of Nantes.

**Closing date of applications**

The closing date of applications is scheduled for Wednesday, June 5th.

Applications should include a detailed CV with at least 2 references that may be contacted, a one-page letter of motivation, transcripts of Bachelor's degree, Master 1 or 2 or engineering degree and if possible a letter of appreciation of the master of research internship at M2 level or engineering school.

**Profile of a student**

The future doctoral candidate will have to demonstrate autonomy, be curious and have the ability to work in a team.

Master's degree or equivalent in the field of physics and chemistry. The future student must have good oral and written communication skills in French and English to participate at conferences and write articles in scientific journals.

**Bibliographie**