Funded by the European Union

FunctiGlass

Project title DC6: Irradiation effect in Ce^{3+} doped phosphate and silicate glasses

Recruiting institution: Universities of Tampere (Finland)

Background

Over the past four decades, **glass, glass-ceramics and composites** have contributed to the most advanced socio-economic breakthroughs as high-tech materials. To compete with emerging economies such as China and India, the European glass sector must strive for product leadership by investing more in research and innovation to develop new materials and train specialists for a competitive but promising market.

Contributing to this challenge is the main objective of the 'Structured functional glasses for lasing, sensing and health applications' (FunctiGlass) project, dedicated to **advanced high-tech materials for three sectors: light sources, sensors and biological applications**.

FunctiGlass, coordinated by CNRS, is a unique interdisciplinary research and training programme with a **double degree** as part of Horizon Europe's Doctoral Networks (Marie-Skłodowska Curie Actions, project 101169415). It will train 11 doctoral candidates who will take part in a joint research training programme based on **very close cooperation between academia and industry.** It will ensure that the trainees are exposed to 11 academic environments (universities and research institutes) and 9 non-academic environments (industry and SMEs) representing 9 different countries. **Each PhD candidate will be supervised by two academic tutors from different countries (spending her/his time between both units) and one mentor (industrial partner)** to ensure cross-sector knowledge sharing and the acquisition of transferable skills with a focus on entrepreneurship and innovation. Through the multi-dimensional training of the FunctiGlass programme, the 11 PhD candidates will excel in the future economy by

acquiring a multi-dimensional perspective and mindset to become **future leaders in glass science and in particular glass-based nano/micro-structured materials.** Through this programme, they will find their own path of innovation in academia or industry.

The project will create the conditions necessary for the establishment of long-term relationships between the academic and private sectors for the transfer of technologies and skills.

5 institutions will award the double degrees: Université Côte d'Azur (Nice, France), Tampere Universities (Finland), Gottfried Wilhelm Leibniz University Hannover (Germany), University Milano-Bicocca (Italy) and the Institute of Low Temperature and Structure Research, Polish Academy of Sciences (Wroclaw, Poland).

Industrial partners: AOI Tech (France), Corning (France), Fastlite (France), Klearia (France), Else Nuclear (Italy), Nobula3D (Sweden), Nyfors Teknologi (Sweden), Rosendahl Nextrom (Finland), Scout Scientific Outsourcing (Poland).

Other universities involved in the project as partners (not awarding doctoral degrees): University of Cergy-Pontoise (France), University of Gent (Belgium), University of Pardubice (Czech Republic), University of Nazarbayev (Kazakhstan), Umeå University (Sweden).

Description of the PhD project

X-rays and gamma radiations (which are highly ionizing) have been employed in several areas of scientific applications such as cancer treatment, elemental analysis, waste removal, agriculture. Direct exposure to these types of radiation can cause health problems such as cancer, irritation and may, in some cases, lead to death. To reduce the amount of damage caused by exposure to these radiations scientists have already obtained promising results which favored the use of non-flexible radiation shielding materials such as concrete as well as lead and its compounds. However, lead is highly toxic and, therefore, unsuitable for radiation shielding on human. To remedy problems of health related issues attributed to concrete and lead, other materials were explored for radiation shielding applications, especially glasses. CeO_2 doped glasses have been found to be promising for radiation shielding.

Aside from application in radiation shielding, quantification of radiation is of tremendous importance, especially in application such as in medicine (diagnostic and treatment), nuclear power supply, fundamental research, industrial manufacturing, sterilization, non-destructive testing, food processing, etc. The incorporation of Ce^{3+} ions in silicate glasses is a crucial issue for luminescence-based sensing applications, especially when thinking of fiber sensors, where the fiber fabrication is based on the MCVD process. In the scope of ionizing radiation dosimetry, optical fiber sensors attract a huge interest due to their small size, intrinsic immunity to electromagnetic interferences, flexibility and ability to be remotely interrogated. They also offer high spatial resolution of the measurement with the possibility to work in hazardous, narrow and constrained environments.

https://www.sciencedirect.com/science/article/pii/S0022309314002142
https://www.sciencedirect.com/science/article/pii/S0272884218321813
https://pubmed.ncbi.nlm.nih.gov/34066035/

Within the FUNCTIGLASS project, the candidate will:

- Produce phosphate and silicate fiber sensor doped with Ce3+ ions. The impact of irradiation on the glasses' spectroscopic properties will be analyzed.
- Design optical fiber sensors
- Identify applications in oncology sensing for the nanoparticles doped fibers
- By the end of the project the aim is to demonstrate that the develop fibers have potential in sensing X-ray and protons.

Practical information

- Contract will start in October 2025, for 4 years.
- Recruiting institution: Tampere University, Faculty of Medicine and Health Technology (Finland)
- Doctoral school: Doctoral Programme in Medicine, Biosciences and Biomedical Engineering.
- Industrial mentor: Rosendahl Nextrom Oy
- Host laboratory: Bioceramics, Bioglasses and biocomposites group, Faculty of Medicine and Health Technology, Tampere University
- Supervisor: Prof. Jonathan Massera
- Co-host laboratory: Institut de Physique de Nice (France)
- Co-supervisor: Prof. Franck Mady
- Secondments: 1 month at Rosendahl Nextrom Oy (Finland) to learn the MCVD process and 3 months at Nazarbayev University (Kazakhstan) to test the fibers' sensing properties.
- The gross monthly salary based on the MSCA rules varies between 1920€ and 4063€, depending on the country of recruitment.
- The student will also receive a mobility allowance and a family allowance (depending on family situation) of up to 600 € and 495€ per month, respectively.

Recruitment criteria

- MSCA Mobility Rule: researchers must not have resided or carried out their main activity
- (work, studies, etc.) in the country of the recruiting beneficiary for more than 12 months in the
- 36 months immediately before their date of recruitment
- All researchers recruited in a DN must be doctoral candidates (i.e. not already in possession
- of a doctoral degree at the date of the recruitment)
- Possession of a Master's degree before the start date of the contract
- Scientific excellence to fit the PhD project
- Fluent (oral and written) English skills as the project operates in English language. The English skills will be assess based on TOEIC, IELTS, TOEFL record.
- Knowledge of the language of the host country may be considered a merit
- Team-mindedness

Criteria specific for PhD6

- Good knowledge in Materials Sciences, Spectroscopic Technique, inorganic materials processing and characterization.
- Work experience in laboratory…
- Master degree in Materials Sciences and Engineering or related…

Application
Documentation to be sent in by the applicants

- Application form completed
- CV + Letter of motivation
- Contact of two reference persons to be contacted by the selection committee (name, relation to the candidate, e-mail address and phone number)
- Complete list of publications and academic works
- Proof of language proficiencies
- Proof of master diploma or 2024 registration to master degree

How to apply?

- Download application form and fill it indicating all the offers you wish to apply for
- Send your application by email to **recruit@functiglass.eu.** The title of your email MUST be:
  FunctiGlass PhD x, x, x application (x, x, x being the number(s) of the PhD position(s) you want to apply for)
- Be careful to join all documentation required (see list above)

Deadline for application
15th April 2025

Contact
contact@functiglass.eu