

1. Summary of the action

In the frame of SYNERGY project (H2020-WIDESPREAD-2020) it is OPEN A CALL for PhD students and Pos-Doc researchers connected to the i3N hub and partner institutions, to join the **DGM course "Laboratory x-ray techniques for materials development and process control" and 9th European School for Young Materials Scientists** to be held in Dresden – Germany, October 5th to 7th and October 7th to 9th, respectively.

The focus of the course is to expand knowledge in the field of nanoscale materials and nanoanalysis. Materials characterization provides the needed information about atomic structure, chemical binding and the 3D microstructure of advanced materials. Within this context, high-resolution X-ray techniques are playing an important role for the development and introduction of new technologies as well as for the integration of advanced materials into high-tech products, and particularly for process control and for quality assessment. One advantage of the X-ray techniques is that they deliver – generally integral – data for bulk materials and thin films non-destructively.

2. Action description

Scientific area: Advanced Functional Materials, Multi-scale materials characterization

Explore advanced functional materials, with emphasis on:

- X-ray diffraction for phase, texture and stress analysis of materials
- X-ray spectroscopy for the determination of materials composition and chemical binding
- X-ray microscopy and X-ray computed tomography for 3D morphology and microstructure analysis of materials.

***Program attached to this announcement**

Requirements: PhD students, Pos-Docs and M.Sc. within i3N whose work plans are related with Advanced Functional Materials and Multi-scale materials characterization.

Methods of selection: The jury chaired by Professor Rodrigo Martins, Professor Luís Pereira and other two researchers to be appointed from CENIMAT/I3N will evaluate the application's merit based on the following:

1. One page motivation letter which should highlight the role and complementarity of this action within the candidate's ongoing work;
2. Short resume of the work plan;
3. Registration form filled with requested data (form attached)
4. Publications (if applicable).

Moreover, other information considered by the candidates as relevant may also be evaluated.

Deadline and submission: The submission is open from 29/06/2020 to 10/07/2020. The applications must be sent by email to Diana Gaspar – dgaspar@uninova.pt.

The researchers (PhD students, Pos-Doc and M.Sc.) selected for the DGM course and school will get support for travel and accommodation.

For further information, please contact Diana Gaspar (dgaspar@uninova.pt).

PROGRAM

DAY 2 | 7 PM
NETWORKING-DINNER

DAY ONE | 1 PM - 6 PM

WELCOME AND INTRODUCTION: FUNDAMENTALS IN X-RAY PHYSICS

- Historical development, major invention
- X-rays: Refraction, reflection, diffraction
- X-ray diffraction, spectroscopy, radiography/tomography
- Status and expected future developments

PROF. DR. EHRENFRIED ZSCHECH (DRESDEN FRAUNHOFER CLUSTER NANOANALYSIS, GERMANY)

X-RAY EXPERIMENTS:

TOOLS AND COMPONENTS – LABORATORY VS. SYNCHROTRON

- X-ray sources: X-ray tubes and synchrotron radiation
- X-ray optics: Reflective and diffractive optics
- X-ray detectors: 0D, 1D, 2D
- The integrated setup: Laboratory tool vs. synchrotron beamline

DR. JÖRG GRENZER (HELMHOLTZ ZENTRUM DRESDEN-ROSSENDORF, GERMANY)

DAY TWO | 9 AM - 6 PM

X-RAY DIFFRACTION:

STRUCTURE AND MICROSTRUCTURE OF CRYSTALLINE MATERIALS

- Fundamentals of X-ray diffraction
- X-ray structure and microstructure analysis
- Texture and stress analysis | Applications in materials science

PROF. DR. DAVID RAFAJA (TECHNICAL UNIVERSITY BERGAKADEMIE FREIBERG, GERMANY)

X-RAY FLUORESCENCE SPECTROSCOPY: ELEMENTAL COMPOSITION

- Fundamentals of X-ray fluorescence spectroscopy
- From point analysis to elemental mapping
- Scanning micro-XRF - a technique for qualitative and quantitative materials analysis

DR. ROALD TAGLE (BRUKER NANO GMBH, BERLIN, GERMANY)

X-RAY ABSORPTION SPECTROSCOPY:

LOCAL ATOMIC AND ELECTRONIC STRUCTURES OF NANOSTRUCTURED MATERIALS

- Fundamentals of X-ray absorption spectroscopy
- EXAFS and XANES analysis
- From ex-situ to operando XAS studies
- Applications in battery research, catalysis and biomedicine

PROF. DR. ALEXANDER V. SOLDATOV (UNIVERSITY ROSTOV-ON-DON, RUSSIA)

BIG DATA AND AI ALGORITHMS FOR THE ANALYSIS OF X-RAY SPECTROSCOPY DATA

- The need of Big Data
- Machine learning (ML) benefits
- Examples of ML applications in materials characterization
- Challenges and limits of the AI technologies.

PROF. DR. ALEXANDER V. SOLDATOV (UNIVERSITY ROSTOV-ON-DON, RUSSIA)

DAY THREE | 9 AM - 2 PM

X-RAY MICROSCOPY:

3D MORPHOLOGY AND MICROSTRUCTURE OF MATERIALS

- Fundamentals of X-ray microscopy
- X-ray radiography and high-resolution computed X-ray tomography
- Data analysis including AI algorithms
- Application in materials science and biology

PROF. DR. EHRENFRIED ZSCHECH

IN-SITU AND OPERANDO X-RAY MICROSCOPY STUDIES

- X-ray microscopy at several photon energies
- In-situ mechanical studies at composites and microchips
- Operando studies at systems for energy storage and conversion

KRISTINA KUTUKOVA, M.Sc. (FRAUNHOFER IKTS DRESDEN, GERMANY)

REGISTRATION FORM

European Advanced Training Course

Dresden, Germany

First name : Surname :

Organisation :
Position :

City : Country :

Mobile Phone : E-mail :