



Università
Ca' Foscari
Venezia

Research fellowship on “Bandgap Engineering of alfa-Sn towards THz Technology” - Università Ca' Foscari Venezia

(Italian law 30 December 2010, n.240, art. 22 and subsequent amendments and additions)

The present document in English is to be considered as a mere summary of the main provisions of the notice of competition which is available in Italian at the following ([link](#)) The text in Italian is the official text of the notice of competition for all legal intents and purposes and, in the event of non-conformity with the present document, it shall prevail.

Description

The Department of Molecular Sciences and Nanosystems at Università Ca' Foscari Venezia invites applications for a fellowship titled “Bandgap Engineering of alfa-Sn towards THz Technology “, SSD: CHIM/07, project PRIN 2022 titled “UltraNarrow Bandgap Engineering of alfa-Sn towards Mid-Infrared/THz Silicon Tehnology” CUP: H53D23004710006”, tutor and principal investigator: Dr. Michele Back.

The research may be carried out in English.

The fellowship is intended to provide the successful candidate with the opportunity to pursue his/her own research while benefiting from the range of expertise at Università Ca' Foscari Venezia.

Abstract in inglese: Electronic structure engineering of group IV semiconductors has leading growing interest in alloys to be implemented in the Si-based electronic industry. Despite the large lattice differences between Si, Ge and Sn, recent advances in the synthetic procedures allowed to stabilize direct bandgap semiconductors with narrow bandgap energies down to 0.3 eV by closing the bandgap of Si and Ge with Sn. In an upside-down view, the zero-bandgap of alpha-Sn (α -Sn) could be opened to stabilize new semiconductors characterized by ultranarrow direct bandgaps in the range of 10-250 meV (2-60 THz) on silicon substrates. Such semiconductors would be exploited in monolithic silicon optoelectronics for the development of the next generation emitting devices and detectors, of particular interest for industrial applications such as 6G transceiver. However, despite the promising theoretical predictions, only recently, the formation of α -Sn allotrope doped with Si characterized by a bandgap of 50 meV was demonstrated by means of an innovative low-temperature synthesis consisting in microwaves (MW) assisted technique. The method relies on irradiating with MW a Si wafer topped with a thin layer of tin deposited by CVD. The candidate will explore alternative strategies for the synthesis and control of α -Sn nanostructures and possibly the dopant concentration (Si or Ge) by first verifying theoretical predictions regarding the correlation between Bandgap and dopant. The given objective is very challenging, in fact, to date there are no "recipes" to produce these materials. The study will begin with tests based on the application of magnetron sputtering technology to produce thin films. This technology is now widely used in the industrial sector which would allow, if successful, a rapid industrialization of the synthesis process.

The work will take place at the Department of Molecular Sciences and Nanosystems of the Ca' Foscari University of Venice.

Who can apply

Prospective candidates are expected to hold a master's degree in the field of chemical, physical and engineering sciences (or equivalent) or equivalent qualification obtained abroad and professional scientific curriculum suitable for carrying out research activities.

Ca' Foscari encourages applications from researchers with positive evaluation in all the criteria in individual proposals such as Marie Skłodowska Curie Actions - Individual Fellowships/ERC Starting Grants/FIRB (Italian Fund for basic research investments)/SIR (Scientific Young Independence Research) or similar.

Researchers having successfully completed Marie Skłodowska Curie Actions - Individual Fellowships/ERC Starting Grants/FIRB (Italian Fund for basic research investments)/SIR (Scientific Young Independence Research) or similar funded projects are warmly encouraged to apply.

The following qualifications are considered as evaluation criteria:



- a. holding a PhD;
- b. having completed the attendance of a PhD programme, although not having yet obtained the PhD title;
- c. specialisation diplomas and attendance certificates at post-graduate specialisation courses, obtained both in Italy or abroad, documented research activity in public and private organisations with contracts, study grants or assignments both in Italy and abroad;

Duration of contract: 23 months, approximately starting: November 2023

Stipend: The research fellowship amounts to 19.619,06 Euros per year (Euros 37.603,19 for 23 months), including taxes and social charges.

Deadline for submission of applications: 16th October 2023, at 12.00 noon.

How to apply:

Candidates shall submit:

1. The application form;
2. A motivation letter (max 1 page) along with their CV in European format, duly dated and signed, both to enclosed as a one single.pdf file ([link](#)); a declaration must be appended in the footnote of the curriculum, pursuant to the Italian DPR 445/2000 and subsequent amendments and additions, that the information provided corresponds to the truth. Moreover the candidates have to consent to the use of their personal data for the purposes of this selection procedure pursuant to the Italian Legislative Decree 196/2003 and to the EU Regulations 2016/679;
3. The attachments called "obligations and understanding" and "participation and compatibility";
4. All documents, qualifications and publications relevant for the selection procedure (please, see the notice - [link](#));
5. A copy of a valid identity document (either Identity Card or Passport);
6. (If available) Evaluation Summary Reports of Marie Skłodowska Curie Actions - Individual Fellowships/ ERC Starting Grants/FIRB (Italian Fund for basic research investments)/SIR (Scientific Young Independence Research) individual proposals having passed all the evaluation thresholds;
7. (If available) Details of Marie Skłodowska Curie Actions - Individual Fellowships, ERC Starting Grants, FIRB (Italian Fund for basic research investments)/ SIR Scientific Young Independence Research funded projects;
8. Declaration on availability to held the interview in remote ([Link](#)) to be send via email at the following address: ricerca.dsmn@unive.it

All the schemes of the quoted documentation are available on the website ([link](#)).

Incomplete applications will be rejected.

How to submit your application

Applications should be submitted by the online procedure, available on this link:

<https://apps.unive.it/domandeconcorso-en/accesso/dsmnbackprin2022>

The candidate, after the uploading, will receive a submission number and an e-mail acknowledging receipt of his/her application.

The candidate if necessary could access the procedures for updating any data and materials by the link provided by the e-mail, in any case any updates must be made no later than the deadline 16th October 2023, at 12.00 noon.

Please note that the University can be contacted for any support needs by the candidate until 24 hours prior to the deadline.



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Please note that in case of an high number of applications and / or weight of the materials loaded by the candidates the system might become slower, Therefore it is suggested not to start the process close to the deadline.

NB: the University does not take on responsibility for wrong or late communication of addresses, nor for any communication problem not depending on the University.

Evaluation

Up to 100 points, specifically:

For qualifications, publications and possible tests, from 0 to 60;

For interview, from 0 to 40.

Selection procedure

The interview will be on 26/10/2023 at 10:00 a.m.

The interview will be held in remote at the link:

meet.google.com/ood-bsot-jhi

The short-list of the candidates admitted to the interview, or any postponement, will be published on the University's webpage on 20/10/2023 ([link](#)).

Information and contacts

Candidates may find further details about the application process and the research project in the official call published on the following ([link](#))

For further information please contact the Research Office, email: ricerca.dsmn@unive.it, Ph: 0412348633/8514.