



PORTAL – Fabrication of direct bandgap, hyper-doped, thin and strain-tailored GeSn:Sb- and GeSn:Al-on-Ge layers

The objective of the PORTAL project is to fabricate direct bandgap, hyper-doped, thin, and strain-tailored GeSn:Sb- and GeSn:Al-on-Ge layers, with enhanced carrier transport properties and light emission and absorption efficiency. To achieve this goal, a combination of deposition and pulsed-laser melting processes will be used. Taking advantage of the ultrafast liquid to solid phase transition will enable the fabrication of high-quality GeSn alloys, doped with Al or Sb above their respective solid solubility. This process methodology is expected to yield fully relaxed or even tensely strained alloys with residual defects. Such materials could bring a new step forward in photonics, particularly for infra-red optical detectors. To acquire an in-depth understanding of the doped-GeSn alloys properties, an interdisciplinary study will be led by applying different laser and deposition conditions, collecting data from several characterization techniques and running simulations. The final outcome of this project aims to build a complete, reproducible and large-scale transferable process for hyper-doped GeSn materials, that could be integrated in high-performance and low-cost devices. In addition to the significant socio-economic impact the PORTAL project is expected to bring, it has been ensured that all possible efforts will be made in favour of environmental considerations. This study will be conducted in a multi-disciplinary research group of the University of Padova under the supervision of Prof. Enrico Napolitani. A two-way transfer of knowledge and savoir-faire between the host organization and the experienced researcher will be favoured by their respective fields of expertise and established collaborations as well as the wide range of equipment provided by the University of Padova. This individual fellowship will enrich the applicant's management and technical skills and expand his professional network, improving the development of his career.

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Total EU Contribution: Euro 172 750,08

Call ID: HORIZON-MSCA-2023-PF-01

Project Duration in months: 24

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