PhD position on wide bandgap semiconductors for nonlinear integrated photonics at the Institute of Physics of Ecole Polytechnique Fédérale de Lausanne

The laboratory of advanced semiconductors for photonics and electronics (LASPE) at EPFL, Switzerland, is actively looking for a motivated PhD student to work on the design, fabrication and optical characterization of AlN-on-sapphire microresonators for nonlinear integrated photonics in the framework of a collaboration with the photonic systems laboratory (PHOSL) also part of EPFL.

Following the growth of single-crystal AlN thin films using in house growth facilities handled by a senior group member involved in the project, the successful applicant will be in charge of their structural and optical characterization by means of high-resolution X-ray diffraction (XRD), atomic force microscopy (AFM), spectroscopic ellipsometry and cathodoluminescence (CL). Based on the material properties, the PhD student will closely interact with a postdoctoral researcher from PHOSL that will be in charge of performing numerical optimization of selected optical elements such as edge couplers and straight waveguides for use in second-harmonic generation (SHG), four-wave mixing (FWM) and supercontinuum generation (SCG) processes. These are the necessary steps prior to the fabrication of dispersion engineered AlN waveguides using electron beam lithography technique. Propagation losses will be determined in collaboration with the postdoctoral researcher using readily available optical techniques and setups from PHOSL for measurement of SHG, FWM and SCG efficiency at telecom wavelengths (1.55 μm). This will be used to optimize the design and fabricate microresonators coupled to bus waveguides not only for telecom operation but also as a second step at visible wavelengths and at 2000 nm. Linear characterization of devices will mostly be conducted using the facilities available at PHOSL to determine the loaded quality factors, the free spectral range and thermo-optic coefficients of the resonators. The fabricated devices will also be tested in FWM and Kerr comb generation experiments.

Requirements: The candidates should have a good knowledge on semiconductor physics and photonics and been inclined to experimental work ranging from nanofabrication to optical characterization. Basic experience with clean room activities and/or simulation of photonic devices (COMSOL, Lumerical) would be a desired asset.

Starting date: between April 1st 2022 and August 1st 2022. Applications will be evaluated on a first arrived first served basis. The search will continue until the position is filled. The hiring of the candidate is subject to admission to the doctoral program in physics or photonics at EPFL. PhD positions last for a duration of four years, provided the selected applicant is successful at the candidacy exam taking place one year after his/her start. The salary will follow the EPFL salary scale for PhD students (same across the institution), which is known to be very competitive at the international level.

Candidates should address (in PDF format) their curriculum vitae, a motivation letter explaining their scientific interest, their official academic transcript, and at least two reference letters from past lecturers/scientific advisers to:

Dr. Raphaël Butté, senior scientist at LASPE, principal investigator for this project, SB-IPHYS-LASPE, Station 6, EPFL, CH-1015, Lausanne, raphael.butte@epfl.ch