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Thesis Defense of Nessim JEBALI on next 12 july.
You can communicate this information to colleagues, who may be interested.

Thesis Defense
Institut Foton – SP team
Monday 12th july 2021, 10:00 am (videoconferencing)

Contribution to the study of the non-linear properties of chalcogenide glass waveguides and micro-resonators

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Abstract

Chalcogenide glasses have raised tremendous attention in recent decades due to their unique optical properties, which make them promising candidate materials for the development of a wide range of photonic applications. In particular, all optical processing in near-infrared telecommunication window is taking advantage of their high optical nonlinearities. These glasses also exhibit low maximum phonon energies which yield broad transparency window from visible to mid-infrared wavelength ranges. Optical sensing platforms could therefore also benefit from the development of these materials. This thesis deals with the development and study of photonic structures made of chalcogenide glasses which can offer solutions based on nonlinear optics for all-optical processing and optical sensing. The dispersion optimized GeSbSe waveguides to obtain a large four-wave mixing (FWM) conversion bandwidth in the near-infrared or to achieve a supercontinuum in the near and mid-infrared regime was studied. A qualitative analysis on the different dimensions of coupled and single micro-resonators was carried out in the near- and mid-infrared regime, respectively. A study of nonlinear dynamical behaviours of a system of coupled microring resonators is carried out using the finite-difference time domain (FDTD) method which involves a full numerical integration of Maxwell's equation. The obtained results were then compared to the coupled mode theories (CMTs). FWM experiments were also performed on a set of GeSbSe waveguides having different index contrasts, different waveguiding structures and different geometrical dimensions. A conversion efficiency of -60 dB was obtained in a 3.8 cm long GeSbSe rib waveguide and a large FWM bandwidth that can span the L and S bands was achieved in high contrast GeSbSe waveguides.

***KEYWORDS** : guided optics ; integrated optics ; nonlinear optics ; nonlinear dynamics ; coupled micro-resonators ; chalcogenide glasses*