STRUCTURED ELECTROMAGNETIC MATERIALS GROUP

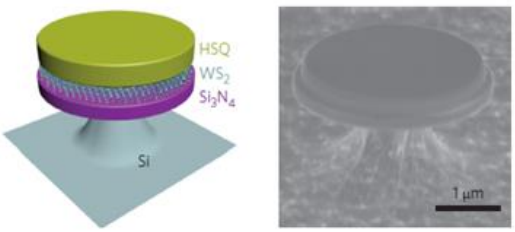
BACHELOR OR MASTER PROJECT

Project title: Monolayer semiconductor laser for future optical interconnects

- **Experiment**

Background:
Photonics technologies are widely used for data communication with their advantages of high capacity and low energy consumption. However, in a chip-scale communication system, electrical interconnects are still used, leading to high power consumption (~50% of the total power) and insufficient communication bandwidth. One potential solution to overcome these limits is to introduce chip-scale optical interconnects. The purpose of this project is to explore and develop a novel class of laser relying on two-dimensional materials [1,2] integrated with silicon photonic chip, which is CMOS-compatible, and suitable for chip-level integration.

Project description:
The main goal of this project is to demonstrate a room-temperature and CMOS-compatible laser with extremely low energy consumption. This project includes preparation of high-quality 2D flakes, nanofabrication of silicon based microcavity, and device characterization with respect to the performance of the light source. This project is aligned with a PhD project, which will be carried out with a close collaboration with Yale University.



An example of 2D laser working at low temperature [2]

References:
[1] S. Wu, et. al., “Monolayer semiconductor nanocavity lasers with ultralow thresholds”, Nature, 520, 69-72 (2015).
[2] Y. Ye, et. al., “Monolayer excitonic laser”, Nature Photon., 9, 733-737 (2015).

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