Study the Gain of GeSn-Based Lasers

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Background/Relevance
• Alloying Sn to Ge is a new technique which promises to provide a group IV direct bandgap material.
• GeSn is compatible to be integrated with Si based ICs, and it is good for different types of devices.

Innovation
• Use GeSn material with new classification of direct bandgap material as photonic devices such as LEDs and Lasers.
• Fabrication of photonic devices such as detector, LEDs, and lasers.

Key Results
• Measured PL for different Sn compositions [0 to 12%] of Sn with several type of doping [n and p] and concentrations.
• Enhancement of the PL intensity for thick films with higher Sn composition (8 to 12%).
• Lasing behavior can be seen at higher Sn composition [10-12%] using optically pumped waveguide structure.

Approach
• Using optical characterizations (PL, Raman, ellipsometry...) to study GeSn to confirm the best material for each application such as lasers.
• Characterize the laser devices that will be fabricated with different doping and composition.
• Optical pumping study for GeSn edge emitting lasers devices using different excited power from several type of lasers.

Conclusions
• GeSn alloy is a promising material for photonic devices from group IV.
• PL measurements shows that GeSn has direct bandgap with high composition between 8 -10%.
• The impact of both type of doping and different concentration on GeSn alloy with different Sn composition are observed.

Future Work
• Study the gain of GeSn with several doping concentration and how it can affect laser devices.
• Optical pumping measurements for edge emitting laser devices of GeSn with high Sn composition [9 – 12%].
• Study GeSn lasing behavior using different power excitation and laser types.