Molecular Beam Epitaxy of GeSn on III-V Material Substrates for Photonic Applications

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Background/Relevance

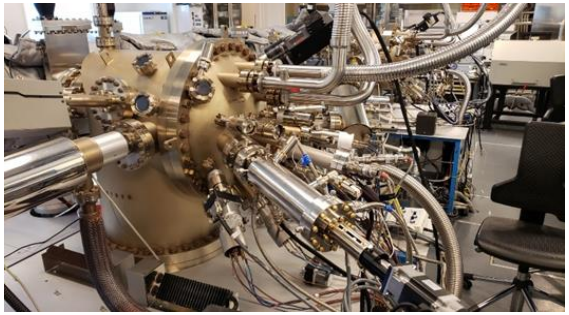
- Currently infrared imaging sensors are rather large and expensive which could be alleviated though research into GeSn systems on III-V material substrates.
- Germanium (Ge) has higher optical absorption efficiency in a range of interest between 1.3-1.6 µm wavelengths for near infrared applications however it has an indirect bandgap. Through the incorporation of Sn, it is possible to shift Ge to a direct bandgap material to become a direct bandgap.

Innovation

- Growth of GeSn using MBE on III-V substrates such as InAs and GaAs.

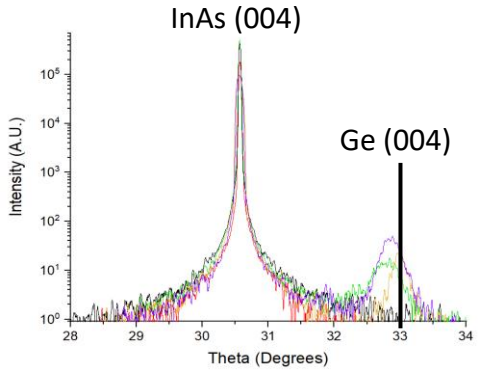
Approach

- Through the use of MBE (Molecular Beam Epitaxy), deposit epitaxial GeSn films on InAs and GaAs substrates.
- Use buffer layers to reduce strain
- Use substrate growth temperatures to affect Sn incorporation



Key Results

- XRD data shows a Sn content of up to ≈ 4.12% in the GeSn structure.



Conclusions

- Sn incorporation is rather low. More experimentation needs to be done to increase Sn percent.
- Low film quality

Future Work

- Increase composition of max GeSn composition and film quality on InAs
- Investigate separately the growth of Ge and Sn on InAs
- Growth GeSn on InGaAs

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