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Supersaturated Ti implanted GaAs for Photovoltaic and Photodetector applications

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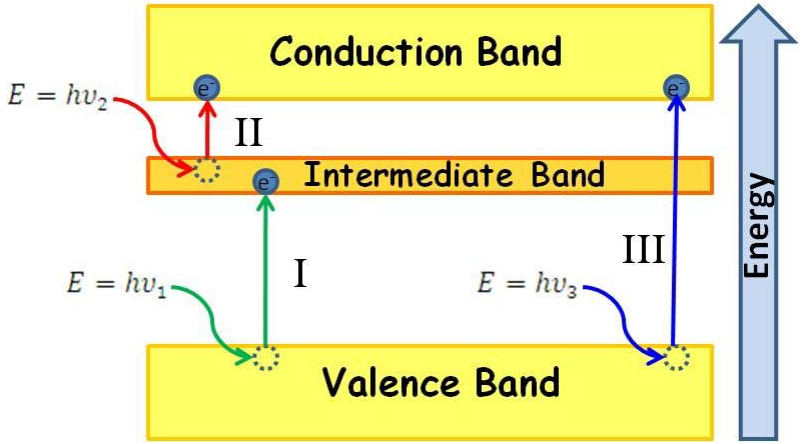
Sari Algaidy

Motivation

Semi Insulated GaAs

Supersaturated GaAs:Ti using above solid solubility limit techniques.

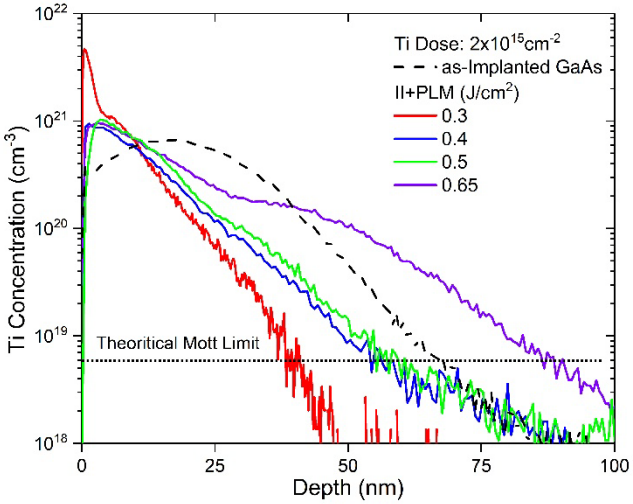
Ion Implantation + Pulsed Laser Melting



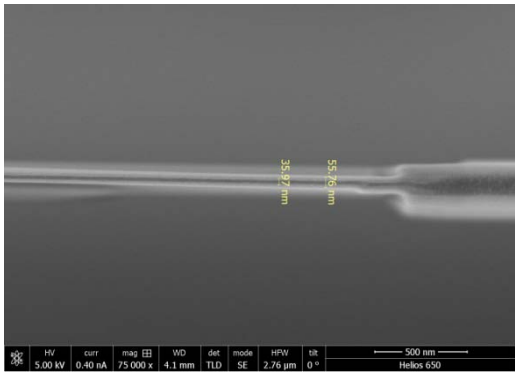
Extending the capabilities of GaAs to absorb below bandgap photons

Processing

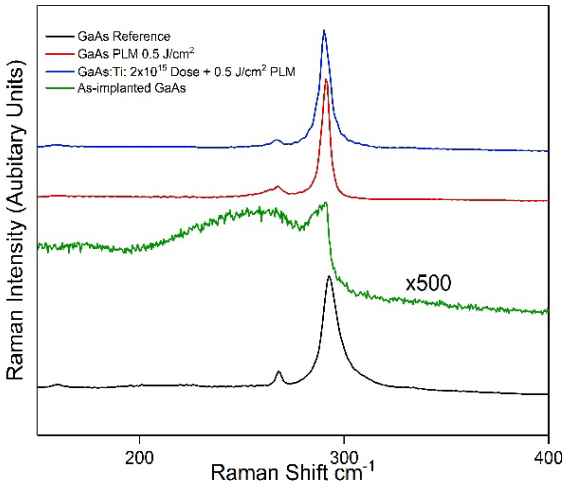
ToF-SIMS

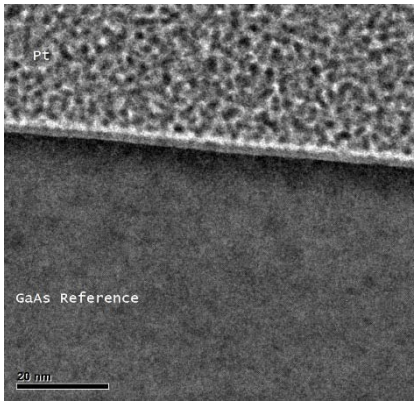


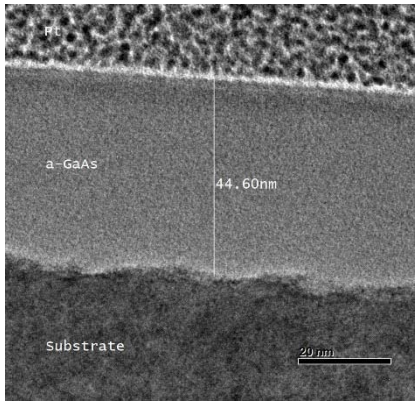
FIB-SEM

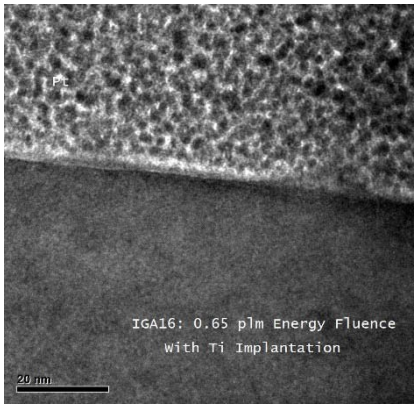


Raman Spectroscopy





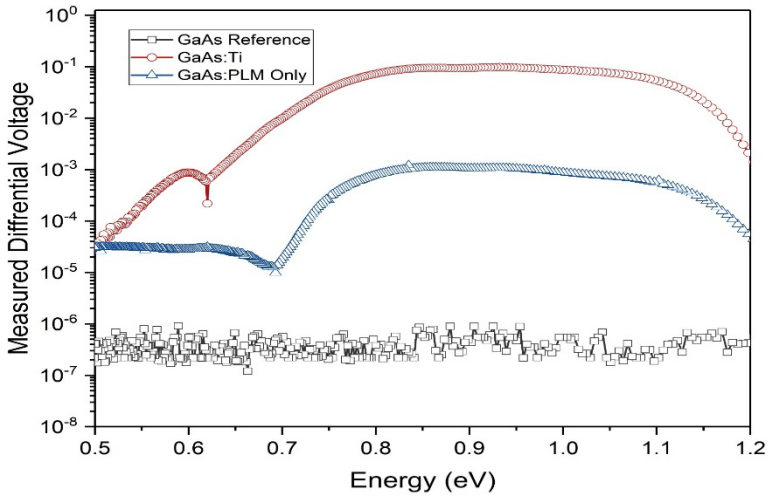




TEM

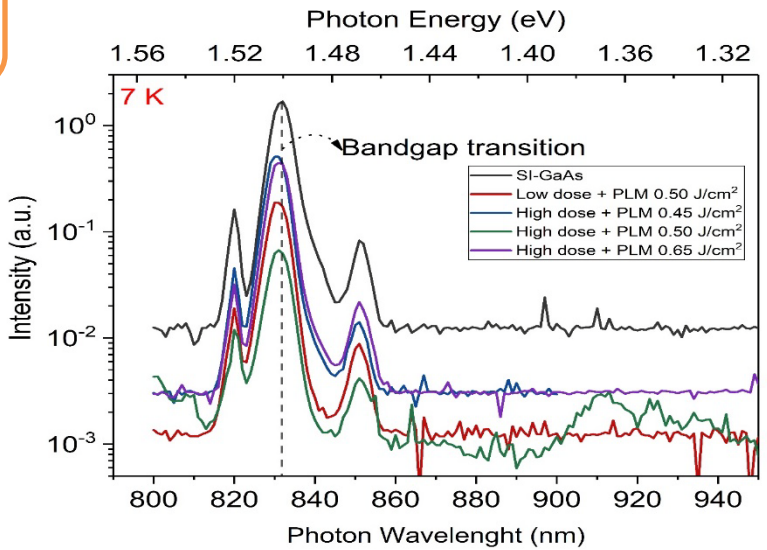
Results

Photoconductivity



Transmittance and Absorption Analysis

Photoluminescence



Further Investigations and Device Fabrication

Two lines of devices possible

- Photodiodes
- Solar Cell

Two articles are in the making showcasing the results:
- Structural Characterization of Ti implanted GaAs Above the solid solubility limits.
- Opto-electrical characterization of implanted GaAs.

Transition Metal	Solid Solubility Limit (atom cm^{-3})	Diffusion Coefficient	Energy Level	Type
Chromium (Cr)	1.6×10^{17}	6.4×10^{-4}	Ev – 0.79 eV	Acceptor
Vanadium (V)	5×10^{16}	7×10^{-4}	Ec - 0.22 eV Ev - 0.80 eV	Donor Acceptor
Titanium (Ti)	Unknown	Unknown	Ev – 0.91 eV	Donor? Acceptor?

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Thank you for listening

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