Optical characterization technique used to obtain the absorption coefficient ($\alpha$).
- Light absorbed by sample is reemitted as heat to the surrounding medium ($\text{CCl}_4$) changing its refractive index. This change is what is detected to elucidate absorption.
- More sensitive than standard reflection and transmission measurements for collecting sub-band gap absorption values.

Electron Spin Resonance (ESR)
- This type of magnetic resonance spectroscopy detects only paramagnetic species (i.e. Unpaired electrons) which are considered defects.
- Applying a magnetic field splits the spin energy states of the electrons, referred to as Zeeman effect.
- When the microwave energy equals the energy separation of states resonance occurs and the electron becomes excited to a higher spin state.

Absorption and Defect Analysis
- Absorption spectrum of the nc-Si film with the lowest amount of c-Si nanoparticles resembles that of a-Si.
- Absorption spectrum of the nc-Si film with the highest amount of c-Si nanoparticles resembles that of free standing Si nanoparticles. The absorption is higher likely due to a-Si filling.

Deposition Technique for Nanocrystalline Thin Films
- Films used were deposited using plasma enhanced chemical vapor deposition (PECVD) reactor.
- Two reactors are used to decouple the deposition of amorphous and c-Si nanoparticles.

Possibilities for Further Insight
- A more accurate measurement of the thickness of samples would provide more accurate values for the absorption.
- With more films spanning from crystalline to amorphous, a clearer trend between the phases absorption spectrum can hopefully be seen.

Importance of Nanocrystalline Silicon
- Amorphous Si (a-Si) and crystalline Si (c-Si) have been extensively studied and their optoelectronic properties characterized.
- It is important now to understand how these two phases interact in nanocrystalline Si (nc-Si) thin films.
- Nanocrystalline Si is of considerable interest for optoelectronic, display, and photovoltaic applications.
- To obtain information about absorption and defects, this study uses photothermal deflection spectroscopy (PDS) and electron spin resonance (ESR).

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