Optimization of thin film solar cells through defect characterization

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Need for solar cells: space research, oil crisis, cleaner energy, stabler energy

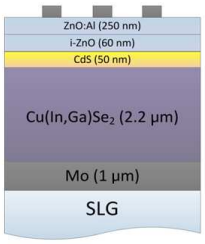
Evolution towards thin film:

Si solar cell absorbs relatively poor → thick absorber needed (~100 µm)

↓

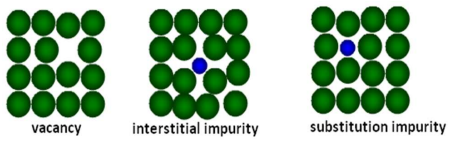
$CuInGaSe_2$ material has high absorption coefficient → thin absorber (~2 µm)

Advantage: lower cost, flexible cell



Problem: defects in absorber lattice reduce efficiency

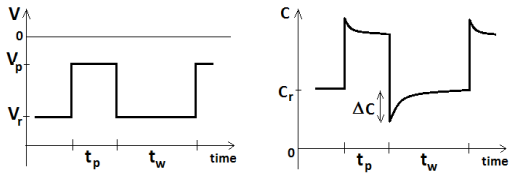
→ Research DiSC: defect characterization



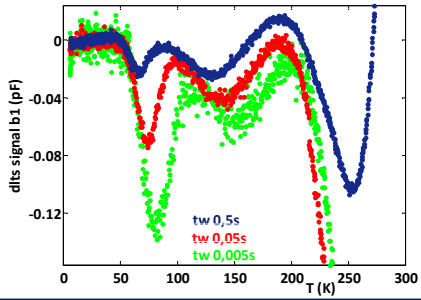
Research methods:

Deep Level Transient Spectroscopy

→measure capacitance transient after volgage pulse for different temperature

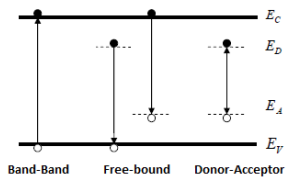


→ deep defects, contact signal

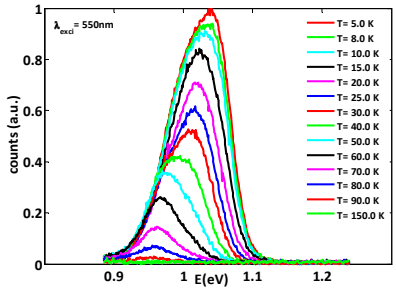


Photoluminescence

→measure light of radiative recombination when cell is illuminated



→ shallow defects



Conclusion: by controlling defects in thin film solar cells the efficiency can be enhanced.