

# Effective Doping of CdTe Towards High Efficiency Thin Film Solar Cell

M. I. Khan, V. Evani, P. Bane, V. Palekis, S. Collins and C. Ferekides

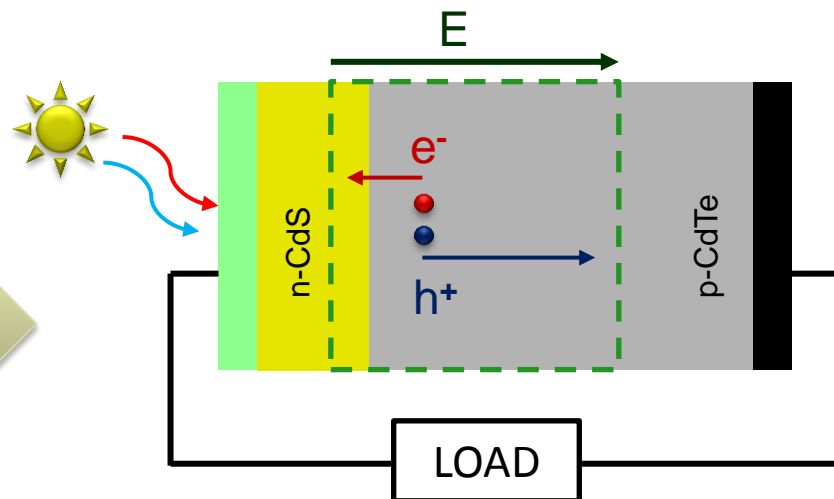
Presented By  
Md Imran Khan

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# Project Objective

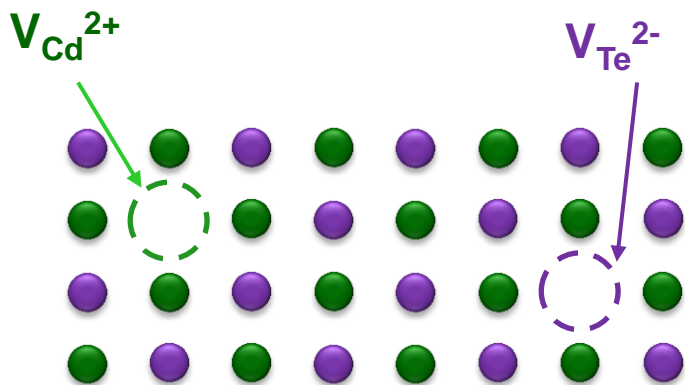
- CdTe highest reported efficiency 20.4%
- Objective:

– Increase **doping concentration** while maintaining **carrier lifetime**



● Cd atom

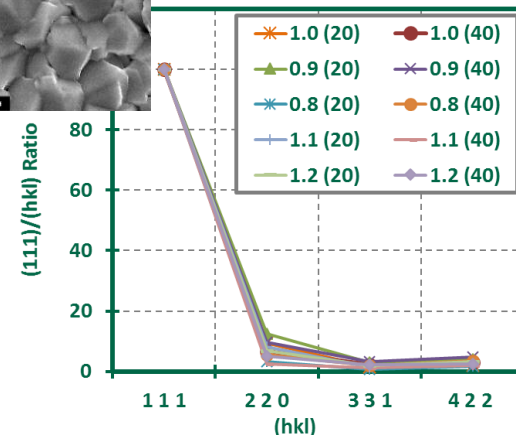
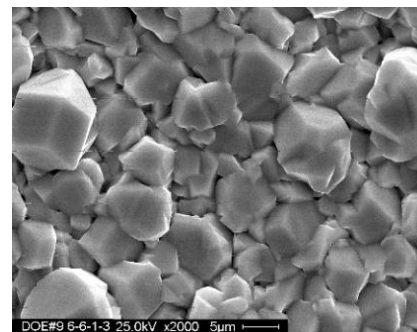
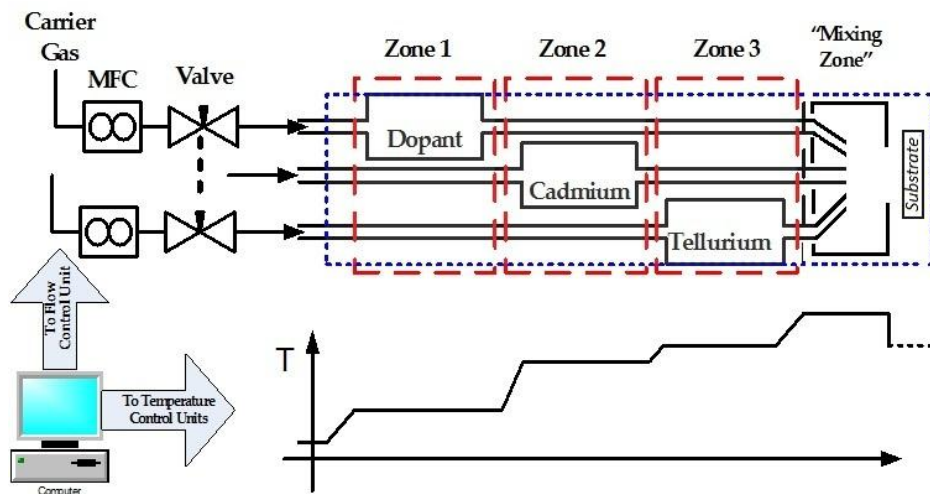
● Te atom



- CdTe is a defect semiconductor
- Stoichiometry of CdTe - critical to accommodate external dopants

# Elemental Vapor Transport

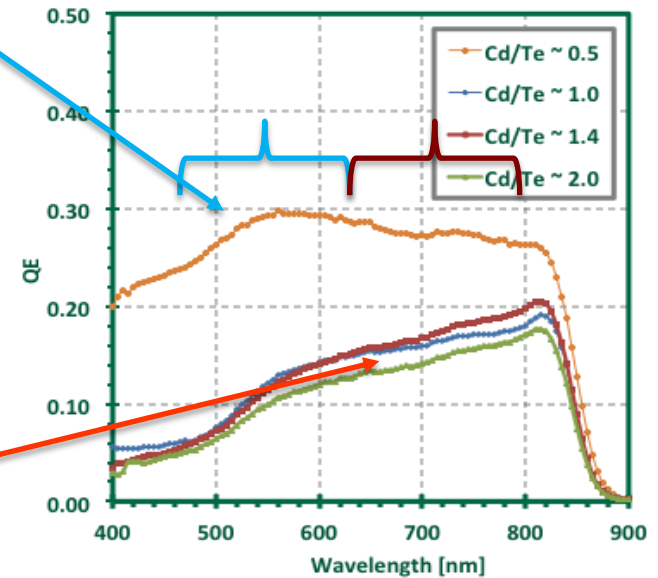
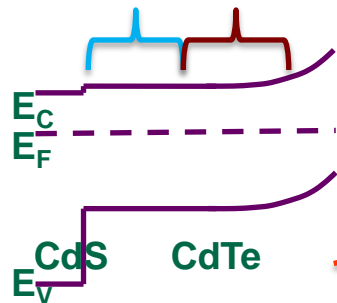
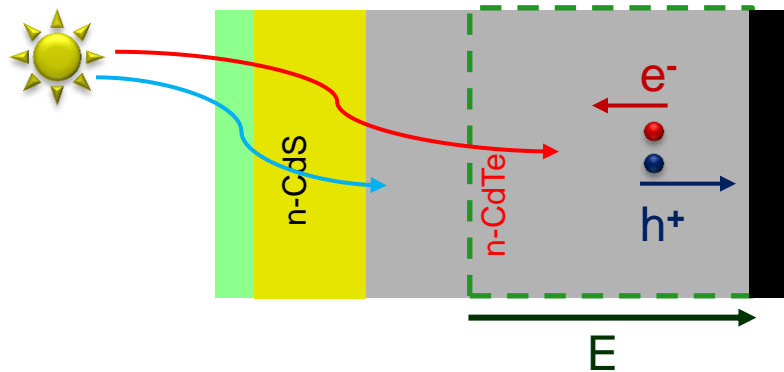
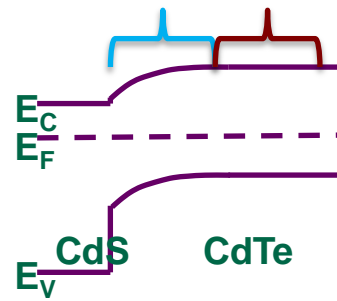
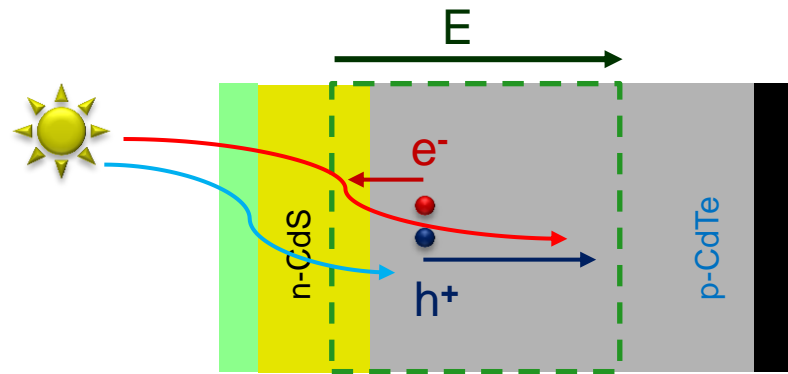
- A process for CdTe deposition under Cd- or Te-rich conditions
- Separate zones for elemental Cd, Te and dopant



- Polycrystalline CdTe films with large grains
- Mostly (111) crystal orientation

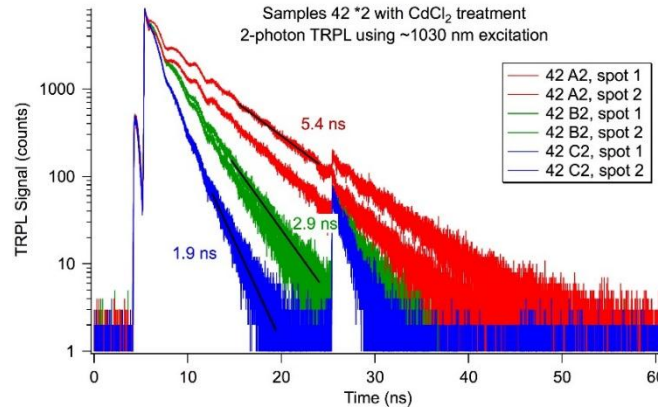
# Cd/Te Ratio Effect

- n-type or p-type films based on the Cd/Te ratio



# Doping and Lifetime

Cd/Te	$\tau_2$ (ns)
0.7	5.4
1.0	2.9
1.4	1.9



- 2-photon TRPL measurements - lifetimes up to 5 ns for CdCl<sub>2</sub> heat-treated samples

- Extrinsic doping of CdTe with group V elements (Sb)
- Increase in doping concentration with Cd/Te ratio (Capacitance-Voltage measurements)

