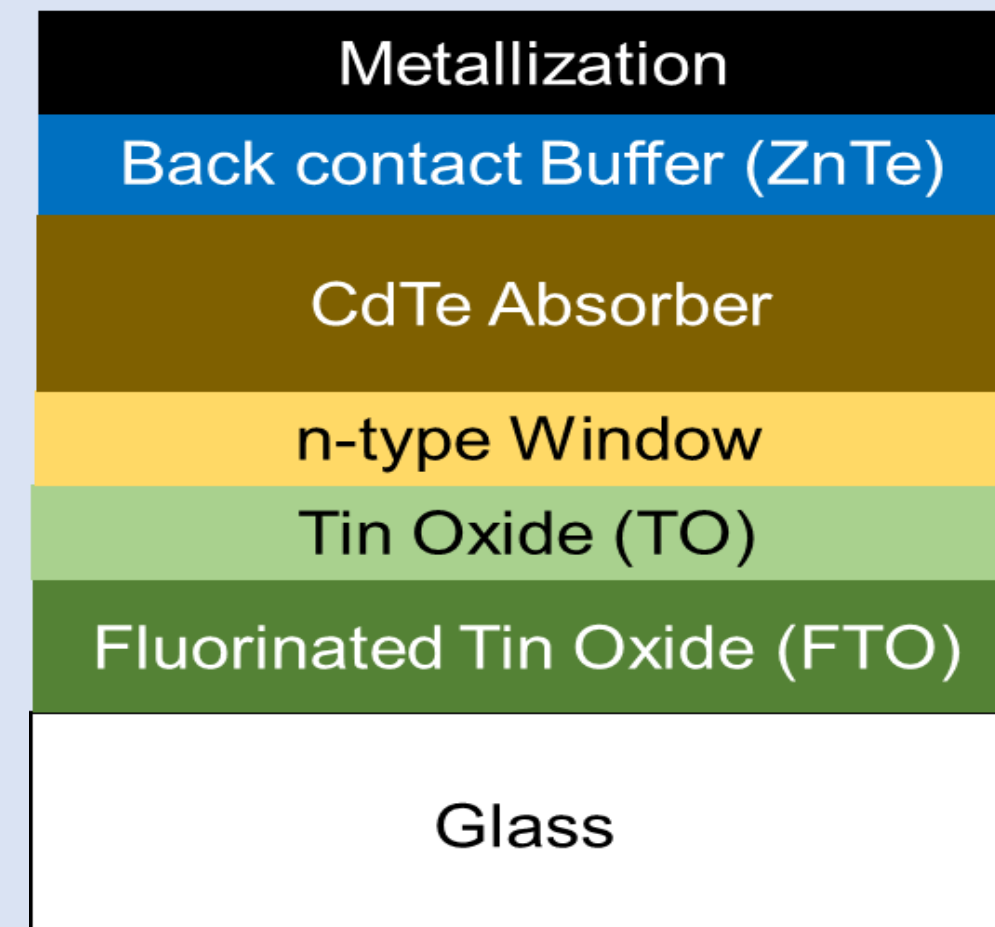


## CdTe Solar Cells

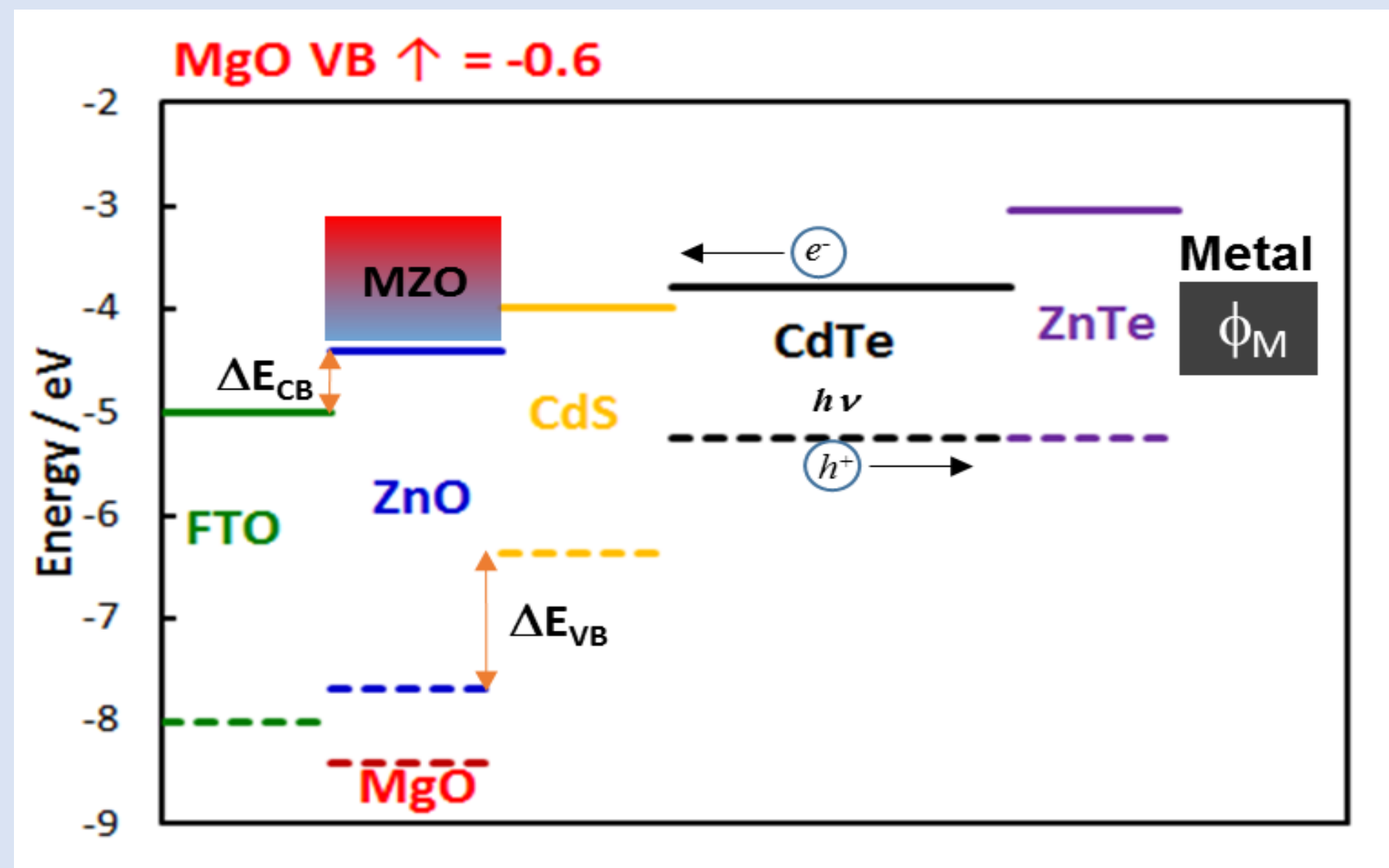
- Leading commercial thin film photovoltaic
- CdS conventional *n*-type window
- Goal: Replace CdS
- Increased transparency
- Improved alignment
- Higher efficiency
- Better stability



CdTe Solar Cell Cross-section

## Why MZO?

- MZO = Mg<sub>x</sub>Zn<sub>1-x</sub>O
- Large, adjustable band gap via Mg substitution into ZnO lattice
- Tune conduction band offset



## Sputter Deposition

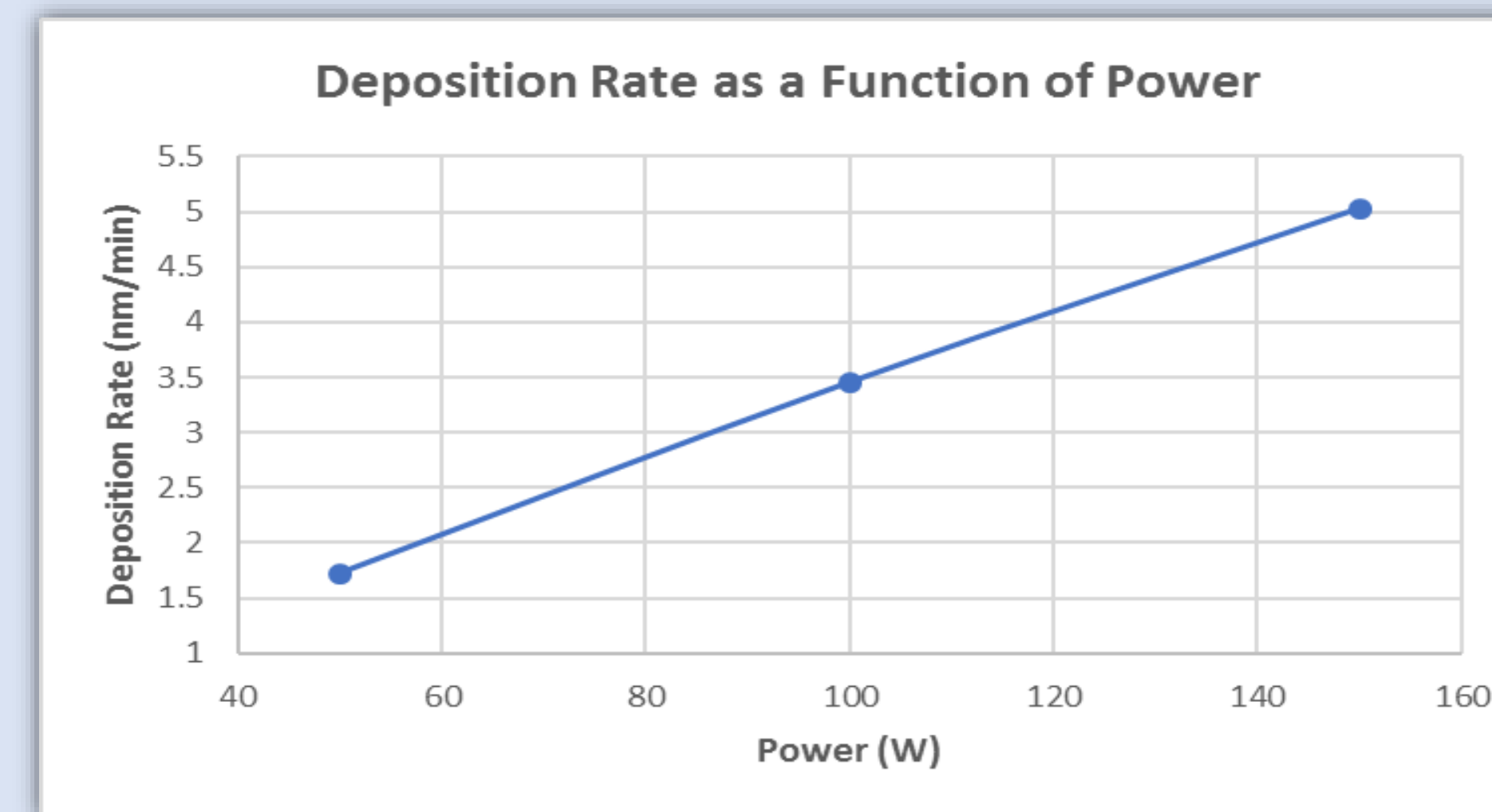
- Substrates: Si and glass slides.
- Validate rate, properties of ZnO and MgO
- Synthesize MZO by co-sputtering



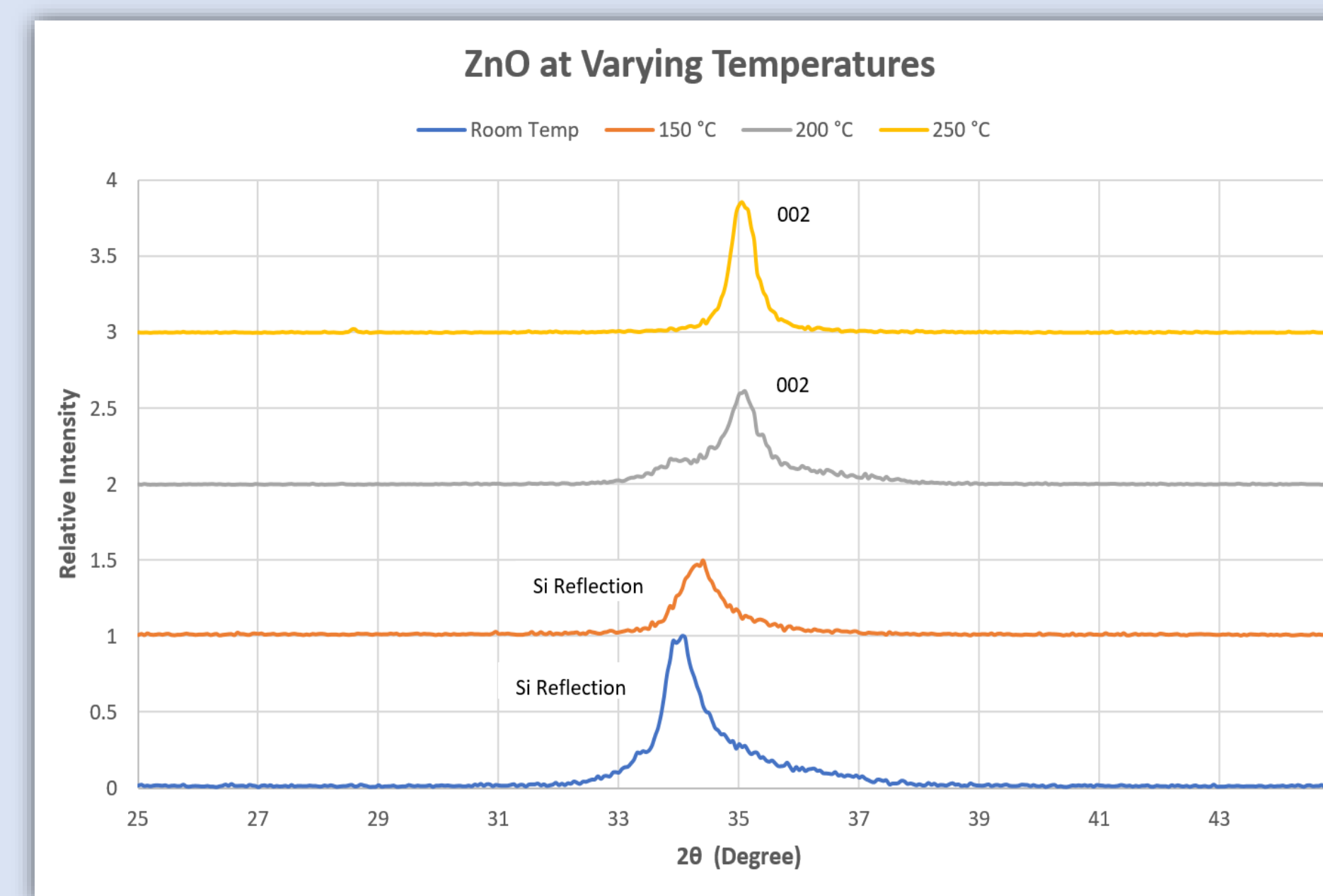
Sputter chamber for thin film deposition

## ZnO Film Deposition

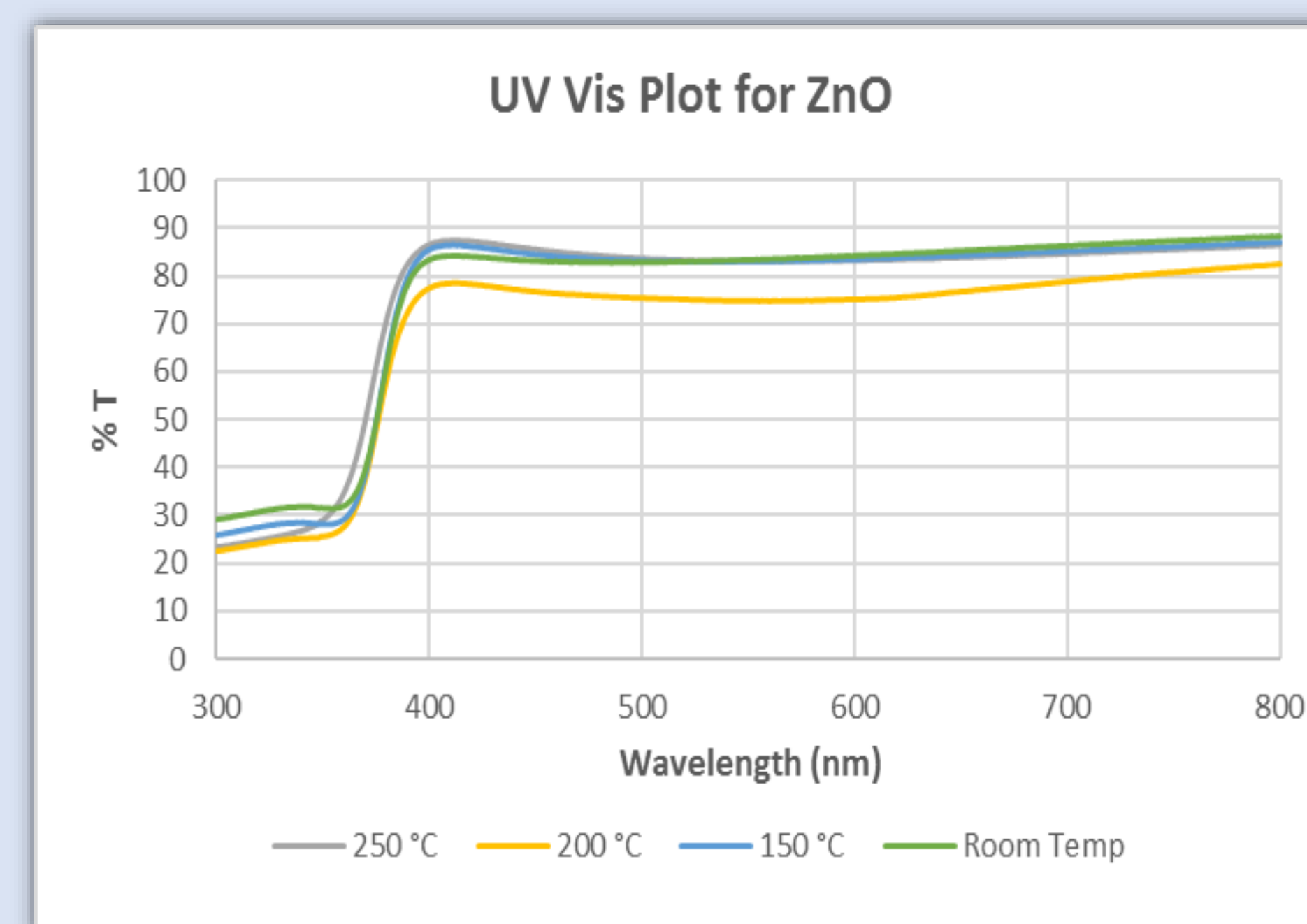
- ZnO target, Ar ambient



- Linear relationship between rate and power observed



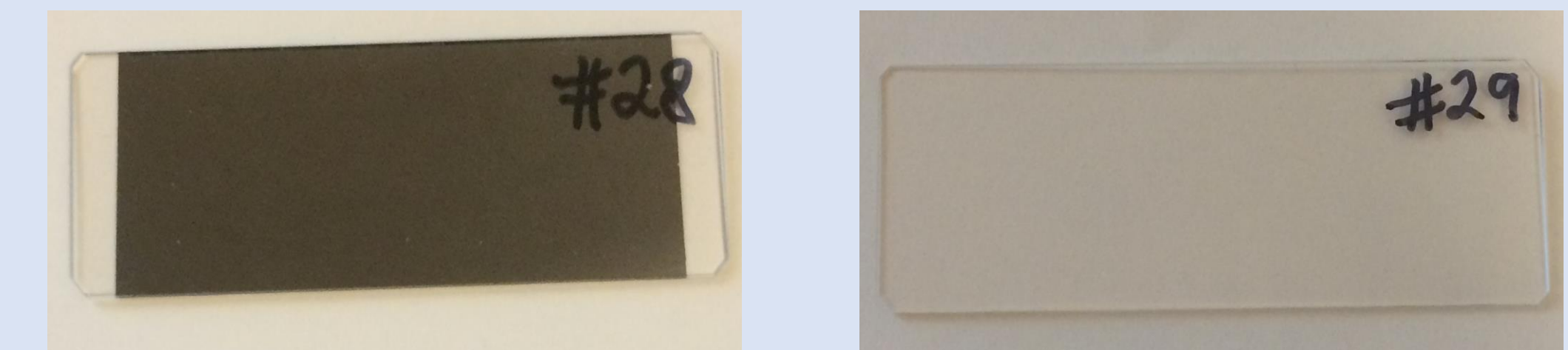
- XRD: Transition from amorphous to crystalline at approx. 200 °C
- Highly textured in 002 orientation



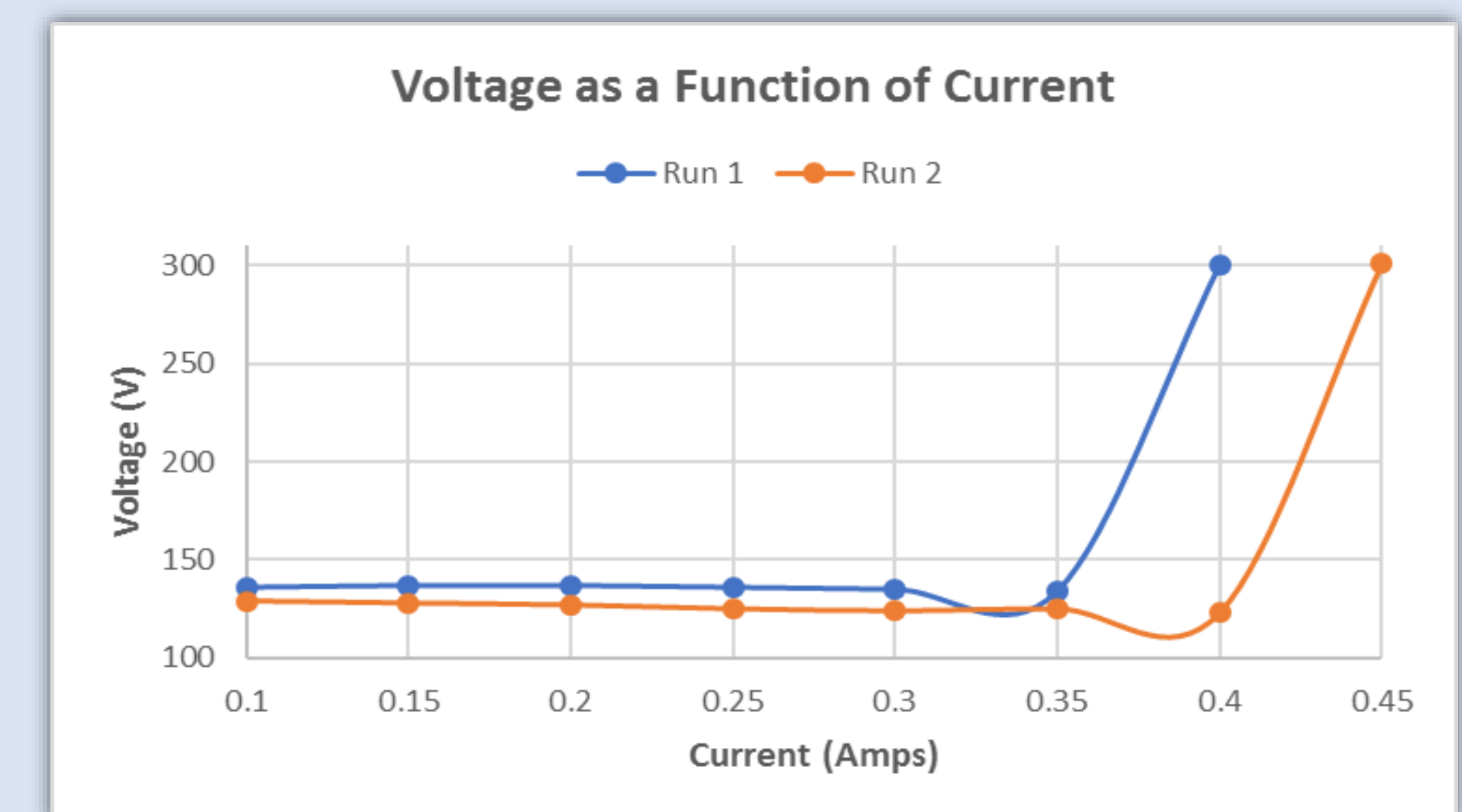
- Optical band gap approx. 3.3 eV
- Appropriate properties

## Reactive Sputtering of MgO

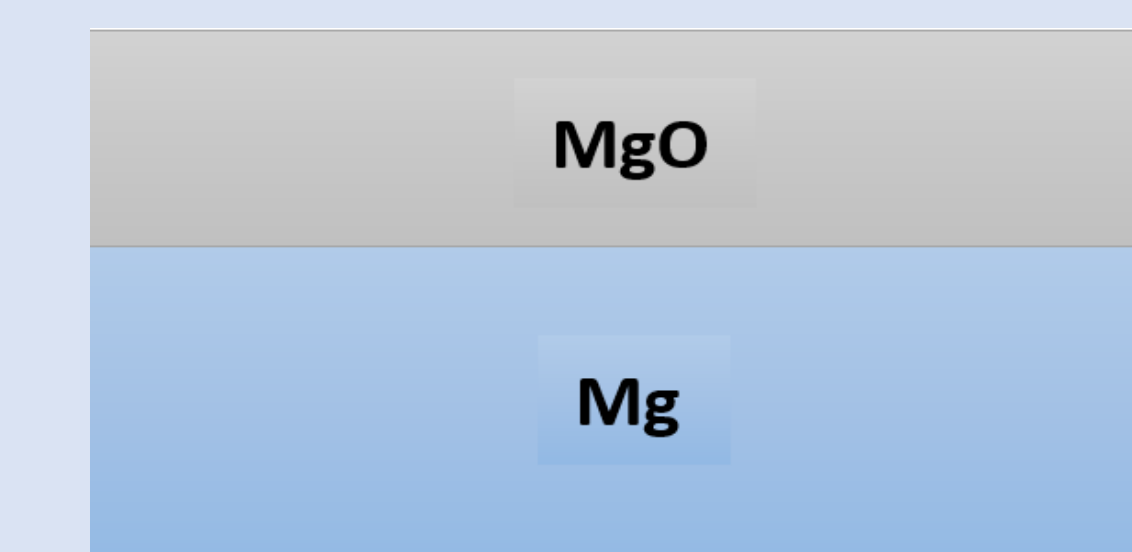
- Mg target, Ar/O<sub>2</sub> ambient
- Room temperature
- Challenge to get metal vs. oxide film



Glass slide with metal layer vs. glass slide with transparent oxide layer



Voltage jump observed in two sputter depositions  
Attributed to changes in target oxidation



Representation of possible oxide layer on target

## Moving Forward

- Achieve reproducible MgO sputtering
- Optimize O<sub>2</sub>%, power, pressure
- Co-sputter MgO and ZnO
- Integrate into solar cells

## Acknowledgements

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