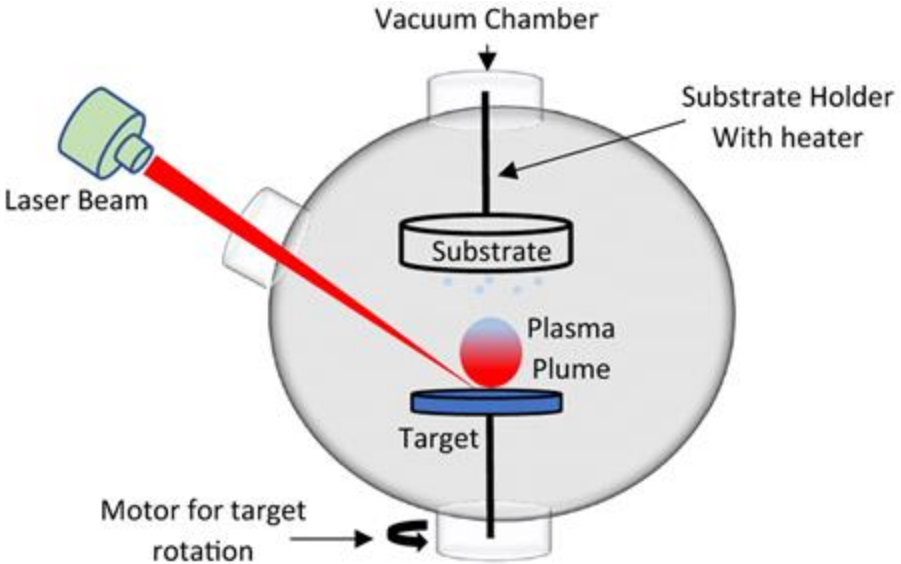
Pulsed Laser Deposition: Basics & Applications

Freda Dong
Advisor: Dr. Thirumalai Venkatesan (Venky)
University of Oklahoma Physics REU 2025

Pulsed Laser Deposition (PLD)

A physical vapor deposition used for thin film growth

1. Laser ablates target material
2. Plasma plume forms & deposits ejected species on substrate
3. Atoms/molecules rearrange & grow as thin film with a crystal structure



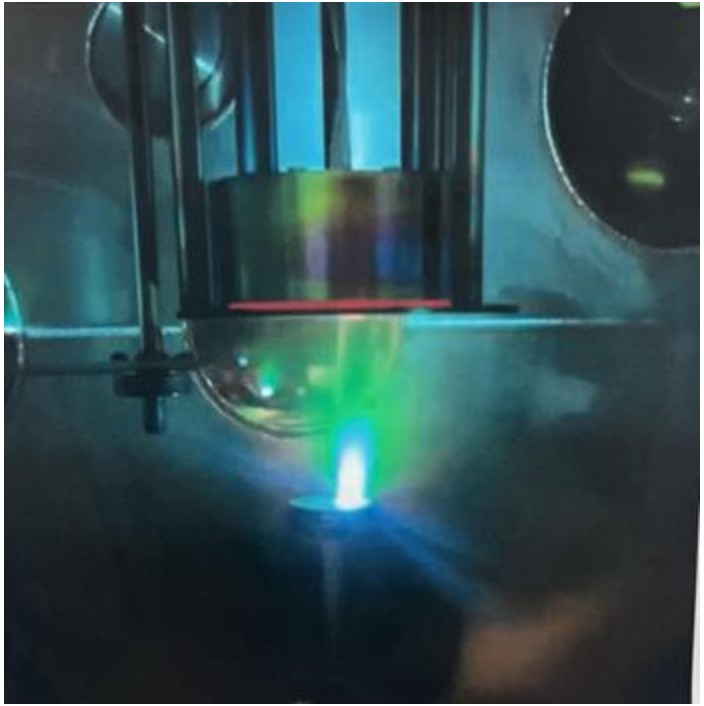
Advantages & Applications of PLD

- Effectively transfers/preserves composition of target material
- Can deposit a wide range of materials (metals, polymers, ceramics, etc.)
- Can create multi-layer depositions
- Allows precise control over film thickness & composition

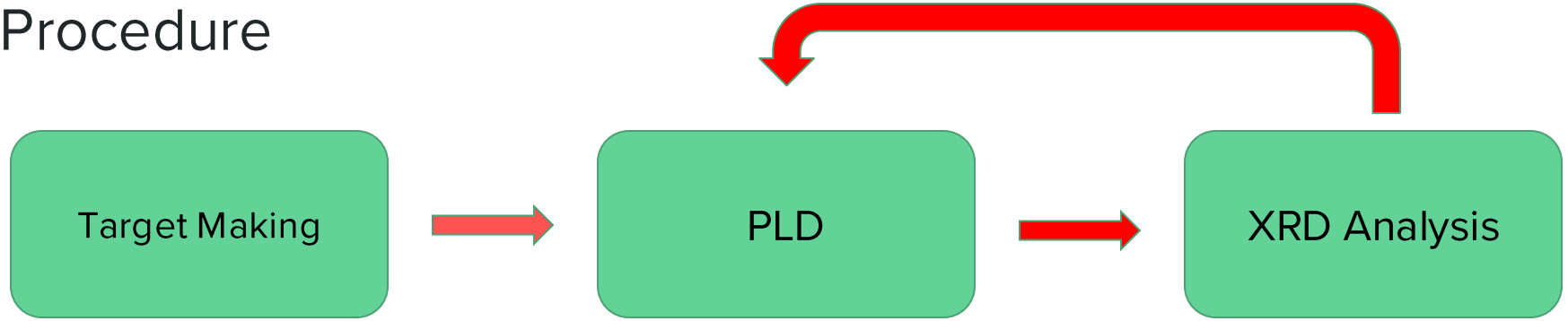
Thin films can be used in optical, electrical, and biomedical devices.

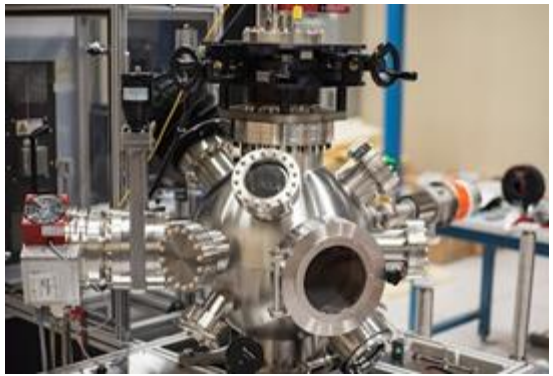
Key Parameters of Thin Film Growth

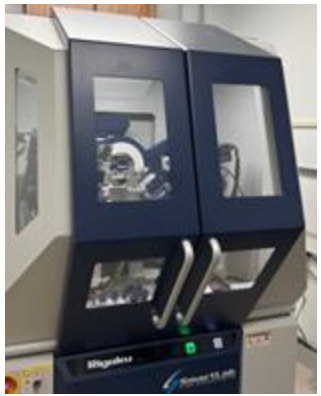
- Laser Fluence (energy per unit area)
- Laser Repetition Rate (Frequency)
- Target to Substrate Distance
- Substrate Temperature
- Background Gas Pressure



Procedure







Depositing WO_3 (Tungsten Oxide) on LAO ($LaAlO_3$ - Lanthanum Aluminate) Substrate

Questions?