Our professor’s research focuses on studying the innate properties of materials when they are organized as thin film crystals. In these lattices, materials tend to display different properties than when they are mixed together (i.e. alloys). We create these thin films using pulsed laser deposition, and monitor the surface characteristics with *in situ* RHEED, AFM, and XRD. Epitaxial thin films have many potential uses in large and small scale electronics.

**Objective & Impact of Professor’s Research**

Vanadium oxides have been the focus of many studies over the past years because of a phase transition that many of the oxides display. Especially important is VO$_2$, which displays both anisotropic properties and a large transition that causes many of the material’s properties to change. This transition is being further studied to see if it can be utilized in special and everyday purposes.

**Introduction**

*V$_2$O$_5$ Target:* During deposition, the pressure in the chamber determines the final vanadium oxide that is deposited on the substrate.

**PLD**

RHEED analysis: We can measure the surface smoothness and count the layers of the deposited crystal by the intensity of electrons that are reflected off the surface.

**Characterization**

XRD: We use x-ray diffraction in order to measure the structure of the film. Different materials have different spacings between atoms, so each compound has its own “set” of peaks on the graph, compounds can be identified by these peaks.

Using Bragg’s Law, I calculated the thickness of the thin film to be about 60 nm.

**Next Steps**

The next steps to further this research would be creating more VO$_2$ thin films and testing their dc conductivities. Next summer, I plan to return to the lab in order to further study the properties of superlattices and complex oxides.

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