Perovskites are a class of material with the general form ABX$_3$, giving them a unique crystal structure. Their specific structural composition gives them highly tunable chemical and physical properties, making perovskites highly versatile. Due to their unique properties, they are promising for a variety of applications, including optoelectronics.

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

Professor Ravichandran’s research focuses on the synthesis and characterization of complex materials such as transition metal perovskite oxides and chalcogenides (containing an S, Se, or Te atom). Specifically, my PhD mentor’s work centers around the characterization of these materials, as well as optimizing processing conditions for device fabrication. I analyzed different data spectra to determine some of the BZS material properties.

**Optical Characterization**

I. **Photoluminescence Spectroscopy (PL)**

Light of various different wavelengths is shined onto a sample and the excitation at each wavelength is measured. The excitation spectra give us important information about the optical bandgap of the material, as well as information about crystallinity and film quality.

II. **UV-Vis Spectroscopy**

White light is shined from a source onto the thin film sample, and we are able to measure the transmittance and reflectance of the film by detecting how much light was reflected off of the surface or absorbed. Using this information, we can extract information such as the material’s absorption coefficient and bandgap energy, as well as the film thickness. These data give us information about the film’s quality and optical properties, which inform processing conditions for device fabrication from these materials. Here, the absorption band edge is around 500 nm, indicating a bandgap of 2.5 eV. Given that the bandgap is fairly large, the film may be amorphous or have imperfect stoichiometry, indicating that the synthesis conditions should be refined.

**Next Steps**

- Regrow films under different conditions to improve stoichiometry
- Continue characterizing using different methods, including different chemical, structural, and electrical characterization methods

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