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## **Characterization of fundamental optical properties of $\text{Cu}_2\text{ZnSnSe}_4$ and the challenge of secondary phases.**

In PV technology, there has been a rapid increase in investigation of quaternary semiconductors  $\text{Cu}_2\text{ZnSn}(\text{S},\text{Se})_4$  as an alternative absorber to the current thin films. Their high absorption coefficient and direct band gap make them a good candidate in solar cell technologies. Besides, lower toxicity and higher earth-abundance of these materials promise a low cost production and a clean solar cell technology. However, there are some challenges which originate from chemical and electrical nature of this material.

In this talk, we focus on the characterization of fundamental optical properties and the challenges of kesterites, i.e. co-existence of secondary phases. Spectroscopic ellipsometry was used as a main tool in order to investigate the fundamental optical properties of  $\text{Cu}_2\text{ZnSnSe}_4$  and the presence of secondary phases in the layers. For data analysis, different approaches of optical model were considered and the results will be discussed in detail.

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