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**Addressing Alloy Broadening in Temperature Dependent Urbach Analysis** AMRAH CANUL, DINESH THAPA, JESSE HUSO, LEAH BERGMAN, University of Idaho — Modeling the temperature dependent Urbach energy distinguishes defect and thermal contributions to the semiconductor band-edge. The current approach of the Urbach energy analysis relies on linear fitting of the Urbach region in semilogarithmic absorption plots. Determining the fitting range in spectra is relatively straightforward for ZnO. However, by alloying with increasing concentrations of Mg, the band-edge was found to broaden and rendered the fitting of the Urbach range difficult, if not impossible. We introduce a novel analytical approach based on the well-known mathematical description of the Urbach energy. Since the Urbach energy relates to the slope of the semilog plot, we extracted this parameter by using first order derivative spectra. These plots are advantageous by providing a greater degree of clarity and an entirely experimental determination of the Urbach energy, removing all ambiguity in locating and determining the Urbach slopes. The advantage of this method over the conventional method is illustrated in ZnO thin film and its ternary alloys  $\text{Mg}_{0.07}\text{Zn}_{0.93}\text{O}$  and  $\text{Mg}_{0.17}\text{Zn}_{0.83}\text{O}$ .

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