ANALYTICAL STRATEGY FOR COMPOSITIONAL AND LAYER THICKNESS ANALYSIS OF COPPER-INDIUM-GALLIUM-SELENIUM ON MOLYBDENUM COATED GLASS SUBSTRATES

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X-ray fluorescence spectrometry typically considered to be a technique for bulk elemental analysis can also be applied to compositional and layer thickness analysis of thin multi-layer materials. One such application is the evaluation of copper-indium-gallium-selenium (CIGS) on molybdenum coated glass substrates to support solar cell research and development efforts. Several analytical technologies are available for elemental analysis and layer thickness determinations: inductively coupled plasma (ICP), x-ray fluorescence (XRF), scanning electron microscopy (SEM), neutron activation analysis (NAA), to name a few. The technology selected for analysis depends on many factors, one being the capability to reproduce measurements or precision. The degree of precision obtainable is a key factor in the ability of an analytical technique to determine differences in composition and layer thickness.

The presentation will review development of an analytical strategy for analysis of CIGS on Mo/glass using x-ray fluorescence spectrometry. The capability of the x-ray fluorescence method to determine differences in composition of CIGS was compared to that of inductively coupled plasma emission spectroscopy through a precision study which used variance components analysis. The variance components analysis allowed for separation of the variance due to method precision from that of sample non-uniformity. A comparison of the analysis results of the x-ray fluorescence method to that of ICP for elemental composition and to SEM for layer thickness will be also presented.