FP-BASED EDXRF CHARACTERIZATION OF THIN FILM SOLAR CELLS

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A fundamental parameter (FP) based energy dispersive X-ray fluorescence analysis (EDXRFA) technique has been developed for inline process control of thin film solar cells. The well-established FP technology has been improved with respect to accuracy and ease of use. The setup of the measuring system and its calibration can be reduced to one measurement of a single reference sample (standard) only. This includes the calculation of the detector response function from the calibration measurement(s). Additional calibration samples are useful to minimize systematic uncertainties but are not needed to define the calibration parameters normally used in XRFA.

In addition, the X-ray fluorescence signal is not only used to measure the characteristics of the thin films, but also as an internal reference-check of the measuring system itself. Critical for inline process control is longterm instrument stability and an instrument capable of reducing systematic errors.

The software compensates fluctuations of the distance between measuring head and fast moving samples. The spectrum itself is used as a probe for the actual measurement distance. It is evaluated and can be displayed as an additional measuring result.

Last but not least, the presence of a sample is detected and the measurement is started automatically in the case of a non-continuous material such as single glass panels.

This method is combined with a robust and reliable measuring head integrated into the process chamber or the process line, capable of measurements in vacuum and high temperature environments.

Above sofware capabilities will be presented using data from industrial scale inline process control of CIGS and CdTe thin film photovoltaics.