

High Energy XRD/XRF for High-Throughput Analysis of Composition Spread Thin Films

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Analysis of thin film inorganic libraries is an increasingly popular technique for materials discovery and optimization. For ternary and higher-order libraries, the high-throughput determination of the crystalline phase fields is an active field of research due to its importance in understanding a given material system. We discuss our techniques for high-throughput data acquisition and analysis using a 60keV x-ray source at the Cornell High Energy Synchrotron Source. Catalyst studies in the Cornell Fuel Cell Institute produce mappings of catalytic activity as a function of substrate position in a thin film composition library. We anticipate that the three material properties that vary as a function of position and will best correlate with trends in the catalytic activity are film composition, crystalline phase, and fiber texture. We demonstrate the efficacy of our technique for simultaneous measurement of these properties. We also discuss the diffraction data processing challenges that are particular to high energy XRD in transmission geometry.