Introduction to Experimental X-ray Diffraction Techniques

Description of the course: Experimental x-ray diffraction techniques for microstructural analysis of materials. Powder diffraction, diffraction from epitaxial and polycrystalline thin films, multilayers, and amorphous materials using medium and high resolution configurations. Determination of phase purity, crystallinity, relaxation, stress, and texture in the materials. Advanced experimental x-ray diffraction techniques: reciprocal lattice mapping, reflectivity, and grazing incidence diffraction.

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References:

1. Lecture Notes.
2. B.D. Cullity, S.R. Stock, "Elements of X-Ray Diffraction", 2001.
3. C. Hammond, "The Basics of Crystallography and Diffraction", 2001.
4. B.E. Warren, "X-Ray Diffraction", 1990.
5. J. Als-Nielsen, D. McMorrow, "Elements of Modern X-ray Physics", 2001
6. P.F. Fewster, "X-ray Scattering from Semiconductors", 2000.

Who Should Take this Class: The class is intended to be an introduction to x-ray diffraction and experimental techniques.

Educational Objectives:

1. Develop an understanding of the properties of x-rays.
2. Learn a Bragg's Law interpretation of x-ray diffraction and the concept of the reciprocal lattice.
3. Develop an understanding of the principles of structural analysis of powders, single crystals and thin films using the x-ray diffractometer.

Schedule for November 2017

Date	Lectures	
11/13	1.	Properties of X-rays. Geometry of Crystals. Introduction to Reciprocal Lattice. Diffractometer Geometry. Optics. Detectors.
11/14	2.	Kinematical Theory of X-ray Diffraction. Powder Method. Powder Diffraction File. Diffraction from Real Samples.
11/15	3.	Thin Film Structural Analysis. Stress & Texture. Reflectivity. Heteroepitaxial Layers. Rocking Curve, Mismatch, Reciprocal Space Mapping.
11/16	4.	Examples. Discussions.