

9-2002

GEOL 580.01: X-Ray Diffraction Techniques in Mineral and Rock Analysis

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Thompson, Graham R., "GEOL 580.01: X-Ray Diffraction Techniques in Mineral and Rock Analysis" (2002). *Syllabi*. 3209.
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G580 - X-ray Diffraction Techniques in Mineral and Rock Analysis

Fall, 2002 - Gray Thompson

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We will work with the rock-forming minerals listed in the syllabus, determining compositional and/or structural properties using techniques appropriate to each group. I will supply samples and a set of references for XRD analysis for each mineral group. Class members may work independently or as a team.

The assignment for each sample or set of samples is:

1. Conduct a literature review of techniques that have been developed for the mineral (group) using the references provided as a starting point.
2. Using all references, select appropriate methods of sample preparation and analysis and perform the necessary XRD analyses to identify the composition and/or structure of the mineral.
3. Present the data, interpretations, and conclusions orally during scheduled class meetings.
4. Submit a brief written report at the end of each project consisting of
 - A. An annotated bibliography of the references used (and those not used as well).
 - B. The XRD data.
 - C. A summary of the interpretations of the data
 - D. An assessment of the procedures.

Week	Topic	Readings/References
1 & 2	Principles and practice of X-ray diffraction	Moore & Reynolds, 1997. X-ray diffraction ... of Clay Minerals 2 nd Ed. Reynolds, 1989. Principles of Powder Diffraction, MSA Reviews in Mineralogy V. 20, pp 1 – 17
	X-ray diffraction analysis and identification of a single mineral: sample preparation methods for analysis of a random powder sample	Moore & Reynolds, 1997. X-ray diffraction ... of Clay Minerals 2 nd Ed. Bish & Reynolds, 1989. Sample Preparation for X-ray diffraction. MSA Reviews in Mineralogy V. 20, pp 73 - 97
	Indexing and interpreting X-ray diffraction data for a single mineral	Fink Index & Search Manual
3, 4 & 5	X-ray diffraction analysis and identification of a mixture of two or more minerals. Quantitative analysis	Fink Index & Search Manual Snyder & Bish, 1989, Quantitative Analysis. MSA Reviews in Mineralogy V 20, pp

6, 7, & 8.	X-ray diffraction as a tool for compositional analysis of carbonate minerals	101 -142 Chave, K.E., 1952. A solid solution between calcite and dolomite, J. Geol. V. 60, pp 190-192. Pilkey, O. H. 1959. The effect of environment on the concentration of Mg and Sr in certain recent echinoid tests. MS Thesis, The University of Montana. Reeder, R.J. & Shepard, C.E., 1983, Variation of lattice parameters in some sedimentary dolomites. Am Min.
9.	X-ray diffraction as a tool for compositional analysis of the olivine group minerals.	Yoder, H.S. & Sahama, Th.G., 1957, Olivine X-ray determinative curve. Am. Min V. 42, p. 475
10, 11, & 12	X-ray diffraction as a tool for compositional analysis of a mineral: Pyroxene group minerals	Zwaan, On the determination of pyroxene by powder XRD, Leidse Geol. Mededelingen v19, p 167 (in Deer, Howie, & Zussman, Rock Forming Minerals v2, p12ff and pp 110-112 Kuno, 1954, Opx in volc. rocks, Am. Min. v39 p30 Hess, 1952, Opx...unit cell dimensions, Am. Jour. Sci. Bowen vol p 173.
13, 14, & 15	X-ray diffraction analyses for structural details of the sheet silicates: polytype determinations for micas, kaolin group minerals, and chlorites	Moore & Reynolds, 1997. X-ray diffraction ... of Clay Minerals 2 nd Ed., pp 112 – 116, 246 – 247 Bailey, S.W, 1984. Classification and structures of the micas. MSA Reviews in Mineralogy V.13, pp 1 – 12 Srodon, J. and Eberl, D.D., 1984. Illite. MSA Reviews in Mineralogy V.13, pp 506 -510

September 23 – Last day to add/drop by Cyberbear – Autumn 2002.

October 14 – Last day drop/adds (no SSS back) – Autumn 2002.