

26402 - Crystallography

Información del Plan Docente

Academic Year	2016/17
Academic center	100 - Facultad de Ciencias
Degree	296 - Degree in Geology
ECTS	6.5
Course	1
Period	Second semester
Subject Type	Basic Education
Module	---

1. Basic info

1.1. Recommendations to take this course

1.2. Activities and key dates for the course

2. Initiation

2.1. Learning outcomes that define the subject

2.2. Introduction

3. Context and competences

3.1. Goals

3.2. Context and meaning of the subject in the degree

3.3. Competences

3.4. Importance of learning outcomes

4. Evaluation

5. Activities and resources

5.1. General methodological presentation

5.2. Learning activities

5.3. Program

Geometric crystallography

1. The notion of crystal: historic development of Crystallography. Order and periodicity. The properties of crystalline

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matter.

2. Crystal lattices. Bidimensional periodic lattices. The Bravais lattices and the crystal systems. Elements of periodic lattices

3. Crystallographic notations: lattice points, lines and planes. Weiss parameters and Miller indices. Relationship between crystal morphology and structure. Empirical laws

4. Crystallographic zones.

5. Symmetry I. Symmetry operations in 2D and 3D

6. Symmetry II. Translational symmetry. The 32 point groups. Crystal systems

and symmetry.

7. Crystal morphology. Forms of the 7 systems.

8. Representing Crystals: stereographic projection.

Structural crystallography and crystal chemistry

9. The symmetry of the unit cell. Space groups. Atomic positions and structural sites.

10. Crystal structures. Rules of the crystal structures. Pauling rules.

11. Chemical variability of crystals: solid solution, isomorphism and stoichiometry (this subject will be taught in English)

12. The X-ray diffraction of crystals. Diffraction methods: fundamentals and the information they provide.

Physical properties of crystals

13. Introduction to the physical properties of crystals, and its relationship with the crystal symmetry

14. Optical properties I. Nature of light and other basics

15. Optical properties II. Optical isotropy and anisotropy. The optical surfaces.

16. Optical properties III. The transmitted-light polarizing microscope.

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17. Optical properties IV. Optical analysis of crystals with parallel light, without analyzer. Optical analysis with parallel light and analyzer. Optical analysis with convergent light.

18. The color of mineral.

19. The electrical, magnetic and thermal properties of crystals.

Crystal Dynamics

20. The real crystal. Defects in crystals and crystal dynamics. The influence of defects on the physical properties of the crystals.

21. Crystal defects: point, line, two and three dimensional defects in crystals.

22. Crystal formation and growth. The morphology of the real crystal. Aggregates and twins.

23. Polymorphism.

Practical sessions

Geometrical crystallography: Sessions 1 to 7

X-ray Diffraction: Session 9

Optical microscopy: Sessions 10-16

Review of Geometric Crystallography: Practice

5.4.Planning and scheduling

5.5.Bibliography and recommended resources

BB Amorós, José Luis. El cristal : morfología, estructura y propiedades físicas / José Luis Amorós . - 4a ed. ampl. Madrid : Atlas, D.L. 1990

BB Bloss, F. Donald. Crystallography and Crystal Chemistry : an introduction / F.

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Donald Bloss . - 2nd printing Washington :
Mineralogical Society of America, 2000

- BB** Bloss, F. Donald. Introducción a los métodos de cristalografía óptica / F. Donald Bloss ; traducido por Paloma Gastesi ; revisado por José M. Fúster Casas . - 5a. ed. Barcelona : Omega, cop.1994
- BB** Cristalografía / José Ma. Amigó... [et al.] Madrid : Rueda, D.L. 1981
- BB** Frye, Keith. modern mineralogy / Keith Frye New Jersey : Prentice-Hall, cop. 1974
- BB** Galí Medina, Salvador. Cristalografía : teoría reticular, grupos puntuales y grupos espaciales / Salvador Galí Medina . - [1a.ed.] Barcelona : PPU, 1992
- BB** Gay, Peter. Introducción al estado cristalino / Peter Gay ; versión española por E. de la Fuente Cullell ; adaptación C. de la Fuente Cullell . - 1ª ed. Barcelona : Eunibar, 1977
- BB** Hammond, Christopher. The basics of crystallography and diffraction / Christopher Hammond Oxford [etc.] : International Union of Crystallography : Oxford University Press, 1998
- BB** Hibbard, Malcolm J.. Mineralogy : a geologist's point of view / M.J. Hibbard.. - 1st ed. Boston : McGraw-Hill, c2002.
- BB** Kelly, A.. Crystallography and crystal defects / A. Kelly, G.W. Groves, and P. Kidd . - Rev. ed Chichester, England : Wiley, 2000
- BB** Klein, Cornelis. Manual de mineralogía : basado en la obra de J.D. Dana / Cornelis Klein, Cornelius S. Hurlbut, Jr. ; [versión española por J. Aguilar Peris] . - 4a. ed. Barcelona [etc.] : Reverté, D.L. 1996-1997
- BB** Modern crystallography / [edited by] Boris

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K. Vainshtein. Vol. 1, Fundamentals of crystals : symmetry and methods of structural crystallography / Boris K. Vainshtein . - 2nd enlarged ed Berlin [etc.] : Springer-Verlag, cop. 1994

BB Nesse, William D.. Introduction to mineralogy / William D. Nesse New York ; Oxford : Oxford University Press, cop. 2000

BB Nesse, William D.. Introduction to optical mineralogy / William D. Nesse . - 2nd ed New York : Oxford University Press, 1991

BB Phillips, F.C.. Introducción a la cristalografía / F.C. Phillips ; [traducido por Juan L. Martín Vivaldi] . - 4a. ed Madrid : Paraninfo, 1988

BB Putnis, Andrew. Introduction to mineral sciences / Andrew Putnis . - [1st. publ.] [Cambridge] : Cambridge University Press, 1992

BB Rodríguez Gallego, M.. La difracción de los rayos X / M. Rodríguez Gallego . - 1a. ed. Madrid : Alhambra, 1982

BB Rosenberg, H.M.. El estado sólido : una introducción a la física de los cristales / H.M. Rosenberg ; traducción de Ana Gómez Antón . - [1a ed.] Madrid : Alianza, D.L.1991

BB Ruiz Cruz, María Dolores. Introducción a la cristalografía para químicos / María Dolores Ruiz Cruz Málaga : Librería Agora, D.L. 1990

BB Santoyo Ramírez, Alicia. Fundamentos de cristalografía geométrica / Alicia Santoyo Ramírez . - 1a. ed. Valencia : López Mezquida, 1981

BB Wenk, Hans-Rudolf.. Minerals : their constitution and origin / Hans-Rudolf Wenk and Andrei Bulakh. Cambridge : Cambridge University Press , 2004.

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LISTADO DE URLs:

Compilación de diversos materiales didácticos para Cristalografía y Mineralogía -
[http://www.ucm.es/info/crismine/TEXTOS_MONOGRAFICOS.htm]

Curso de Cristalografía con notas de óptica en PPT -
[<http://www.geo.umass.edu/courses/geo311/lectures.html>]
]

Curso de Cristalografía en español - [
<http://www.uned.es/cristamine/inicio.htm>]

Curso de Mineralogía -
[<http://www.tulane.edu/~sanelson/eens211/#Lecture%20Notes>]

Curso de óptica -
[<http://ffden-2.phys.uaf.edu/213.web.stuff/Rachel%20Ingersoll/WEBPAGE1/index>]
]

Curso de óptica en PPT -
[http://www.umanitoba.ca/faculties/science/geological_sciences/faculty/sherriff/we]
]

Formas cristalinas y minerales que las presentan -
[<http://www.rockhounds.com/rockshop/xtal/index.html#index>]
]

IUCr - CWW Teaching and Education in Crystallography -
[<http://www.iucr.org/cww-top/edu.index.html>]

Notas de óptica -
[http://www.science.smith.edu/departments/Geology/Min_jb/Optics/]
]

Óptica microscópica -
[<http://www.brocku.ca/earthsciences/people/gfinn/optical/222lect.htm>]

Página sobre Mineralogía que incluye enlaces a temas de Cristalografía -

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[<http://webmineral.com/>]

Recopilación de recursos en internet sobre
Mineralogía -
[<http://homepages.udayton.edu/~koziolam/resminpet.html>
]

Recopilación de recursos en internet sobre
Mineralogía - [
<http://www.minerant.org/software.html>]

Sobre difracción de rayos X -
[<http://www.eserc.stonybrook.edu/ProjectJava/Bragg/index.html>
]