

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Rentgenska difrakcija s kristalografijo
Course title:	X-Ray Diffraction Crystallography

Študijski programi in stopnja	Študijska smer	Letnik	Semestri
Geologija, druga stopnja, magistrski	Geoololje in geomateriali (modul)	1. letnik, 2. letnik	Zimski

Univerzitetna koda predmeta/University course code:

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samostojno delo	ECTS
45	0	30	0	0	75	5

Nosilec predmeta/Lecturer:

Vrsta predmeta/Course type:

Jeziki/Languages:	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Prerequisites:

Zaključen dodiplomski študij, osnovna računalniška pismenost.	Completed undergraduate study, basic computer literacy.
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Vsebina:

Content (Syllabus outline):

Simetrija v kristalih - zunanja simetrija in točkovne grupe - notranja simetrija in prostorske grupe Uporaba rentgenske svetlobe v kristalografiji Izvor rentgenskih žarkov Rentgenske cevi Absorbpcija rentgenskih žarkov Osnove rentgenske difrakcije Rentgenski difraktometer - različne geometrije Priprava vzorcev za praškovno difrakcijo Pridobivanje kvalitetnih podatkov praškovne difrakcije Preliminarne obdelave podatkov in fazne analize Principi kvantitativne fazne analize - metode notranjega in zunanjega standarda, metode brez standarda Programska oprema za Ritveldovo metodo Prepoznavanje vrste in količine mineralov v izbranih materialih Določanje in prilagajanje osnovne celice (primeri)	Crystall symmetry - Finite symmetry and point groups - Infinite symmetry and space groups X-ray diffraction in crystallography Production of X-Rays X-Ray tubes X-Ray absorption Fundamentals of X-Ray diffraction X-Ray diffractometers – different geometry Sample preparation techniques Collecting quality powder diffraction data Preliminary data processing and phase analyses Quantitative phase analyses principles – internal/external/without standard methods Software for Rietveld refinement Phase identification and Quantitative Analysis in selected materials Determination and Refinement of the Unit Cell (examples)
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Temeljna literatura in viri/Readings:

Izbrana poglavja iz: GIACOVAZZO, C., 1992, Fundamentals of crystallography, Vol. 7, Oxford University Press, USA, 827 p.p. BLOSS, F.D., 2000, Crystallography and crystal chemistry, MSA, Washington PECHARSKY, V.K., & ZAVALIJ, P.Y., 2009, Fundamentals of powder diffraction and structural characterization of

Cilji in kompetence:

CILJI: Študenti pridobijo znanje o temeljih kristalografije, simetriji, strukturi kristalov ter z njo v povezavi kemijske in fizikalne lastnosti kristalov. Osvojijo teoretične principe rentgenske difrakcije, poznajo pripravo vzorcev in delovanje difraktometra ter so usposobljeni za kvalitativno in kvantitativno fazno analizo mineralnih materialov.
KOMPETENCE: Sposobnost določanja fizikalnih in kemijskih lastnosti kristalov ter povezovanja s strukturo in sestavo, samostojno izvesti kvalitativno in kvantitativno mineraloško analizo poljubnega naravnega materiala z metodo praškovne rentgenske difrakcije.

Objectives and competences:

OBJECTIVES: Students acquires knowledge of fundamentals of crystallography, symmetry, crystal structures with chemical and physical properties. Students gets familiar with teoretical principles of X-Ray diffraction, sample preparation and diffractometer geometry. Students are qualified for qualitative and quantitative phase analyses of mineral materials.

COMPETENCES: Students are able to:
- Determine physical and chemical properties of the crystals
- Determine crystal structure
- Perform qualitative and quantitative mineralogical analysis of any natural material with X-Ray powder diffraction method

Predvideni študijski rezultati:

Študent pozna strukturo kristalov, razume njeno povezanost s fizikalnimi in kemijskimi lastnostmi, razume principe praškovne rentgenske difrakcije ter zna primerno izbrati in izvesti analizo ter kompetentno kvalitativno in kvantitativno vrednotiti rezultate analize.

Intended learning outcomes:

Students get familiar with crystal structure and understands its relationship with physical and chemical properties. They develop knowledge and understanding about powder diffraction principles and are able to appropriate select, carry out and qualitatively and quantitatively evaluate the results of the analyses.

Metode poučevanja in učenja:

Predavanja, seminarske vaje (30) v laboratoriju in računalniški učilnici, samostojno reševanje problema v obliki seminarske naloge.

Learning and teaching methods:

Lectures, laboratory work and work with computers, independent resolving of the problem in the form of the seminar work.

Načini ocenjevanja:

Delež/Weight

Assessment:

teoretična vprašanja	30,00 %	theory
kvantitativna mineraloška analiza dveh različnih difraktogramov	25,00 %	quantitative mineralogical analysis two diffractograms
določanje in prilagajanje osnovne celice (en primer)	25,00 %	determination and refinement of the unit cell (one example)
seminarska naloga	20,00 %	seminar work
Ocenjevalna lestvica: 51-60% (6); 61-70% (7); 71-80% (8); 81-90% (9); 91-100% (10) ob upoštevanju Statuta UL in fakultetnih pravil.		Grading scale: 51-60% (6); 61-70% (7); 71-80% (8); 81-90% (9); 91-100% (10) UL and faculty rules.

Reference nosilca/Lecturer's references:

NAGLIČ, Iztok, ILIČ, Semjon, MARKOLI, Boštjan, DOLENEC, Matej, LESKOVAR, Blaž, FILIPIČ, Žan, PERHOČ, Matej, KRANER, Jakob, BIZJAK, Matej, SKELA, Božo, KELHAR, Luka, KOZOLE, Špela, GERČAR, David, RAMŠAK, Teja. Modifikacija zlitine AlSi7Mg lite v peščeno formo = Modification of AlSi7Mg alloy cast in to a sand mould. Livarski vestnik, ISSN 0024-5135, 2016, vol. 63, no. 1, str. 37-47.
MILER, Miloš, AMBROŽIČ, Bojan, MIRTič, Breda, GOSAR, Mateja, ŠTURM, Sašo, DOLENEC, Matej, JERŠEK, Miha. Mineral and chemical composition of the Jezersko meteorite - a new chondrite from Slovenia. Meteoritics & planetary science, ISSN 1086-9379, 2014, vol. 49, no. 10, str. 1875-1887.
DOLENEC, Tadej, REČNIK, Aleksander, DANEU, Nina, DOBNIKAR, Meta, DOLENEC, Matej. Celestine from the Idrija mercury-ore deposit (Western Slovenia): its occurrence and origin = celestin iz živosrebrovega rudišča Idrija (zahodna Slovenija): njegove značilnosti in pogoji nastanka. RMZ - Materials and geoenvironment, ISSN 1408-7073, 2005, vol. 52, no. 2, str. 429-436.