

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Osnove kemije materialov
Course title:	Fundamentals of Chemistry of Materials

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Nanoznanosti in nanotehnologije, 2. stopnja	/	1	1
Nanosciences and nanotechnologies, 2 nd cycle	/	1	1

Vrsta predmeta / Course type Obvezni / Mandatory

Univerzitetna koda predmeta / University course code: NANO2-264

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30	30			30	210	10

**Navedena porazdelitev ur velja, če je vpisanih vsaj 15 študentov. Drugače se obseg izvedbe kontaktnih ur sorazmerno zmanjša in prenese v samostojno delo. / This distribution of hours is valid if at least 15 students are enrolled. Otherwise the contact hours are linearly reduced and transferred to individual work.*

Nosilec predmeta / Lecturer: Doc. dr. Matjaž Spreitzer

Jeziki / Languages: **Predavanja / Lectures:** slovenski, angleški
Slovenian, English

Vaje / Tutorial:

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

Zaključen študij prve stopnje s področja naravoslovja ali tehnike ali zaključen študij prve stopnje na drugih področjih z znanjem osnov s področja predmeta.

Prerequisites:

Completed first cycle studies in natural sciences or engineering or completed first level studies in other fields with knowledge of fundamentals in the field of this course.

Vsebina:

Predmet je razdeljen na naslednja poglavja:

- osnovni koncepti kristalne strukture trdnin,
- metode določanja kristalne strukture in identifikacije kristaliničnih faz,
- osnove defektov v kristalni strukturi,
- masni in električni transport v trdninah,
- fazni diagrami,
- mehanske, električne in magnetne lastnosti materialov.

Content (Syllabus outline):

The course is divided into following sections:

- Fundamental concepts of crystal structure of solids,
- Methods of crystal-structure determination and determination of crystalline phases,
- Defects in crystals, basic concepts,
- Mass and electrical transport in solids,
- Phase diagrams,
- Mechanical, electrical and magnetic properties of materials.

Temeljni literatura in viri / Readings:

A. R. West. Solid State Chemistry and Its Applications. John Wiley & Sons (2014). ISBN-13: 978-1119942948.

C. Giacovazzo, H. L. Monaco, G. Artioli, et al. Fundamentals of Crystallography. Oxford University Press (2011). ISBN-13: 978-0199573660.

G. Friedbacher, H. Bubert. Surface and Thin Film Analysis. Wiley-VCH (2011). ISBN: 978-3-527-32047-9.

C. Barry Carter, M. Grant Norton. Ceramic Materials: Science and Engineering. Springer (2013). ISBN: 978-1-4614-3523-5

V. Pecharsky, P. Zavalij. Fundamentals of Powder Diffraction and Structural Characterization of Materials. Springer Science+Business Media (2009). ISBN-13: 978-0387095783.

Cilji in kompetence:

Cilj predmeta je pridobiti pregled na področju kemije materialov.

Objectives and competences:

The goal of this course is to give an overview in the field of chemistry of materials.

Predvideni študijski rezultati:

Razumevanje osnovnih kemijskih konceptov, ki se uporabljajo pri karakterizaciji materialov. Študentje naj bi razumeli osnove kristalne strukture trdnih snovi, osnove kemijskih reakcij v trdnem stanju, binarne in ternarne fazne diagrame ter osnovne principe, povezane z lastnostmi materialov.

Pridobljeno zanje bo študentom omogočilo povezati strukturne značilnosti materialov s specifičnimi mehanskimi, električnimi oz. magnetnimi lastnostmi.

Intended learning outcomes:

Understanding of basic chemical principles utilized in characterization of materials. Students should understand basics of crystal structure of solids, basics of chemical reactions in the solid state, binary and ternary phase diagrams and basic principles regarding properties of materials.

The acquired knowledge will enable students to correlate materials structural properties with their specific mechanical, electrical or magnetic characteristics.

Metode poučevanja in učenja:

Interaktivna predavanja
Konzultacije
Individualno voden študij
Seminar

Learning and teaching methods:

Interactive lectures
Consultations
Individual guided studies
Seminar

Načini ocenjevanja:

Ustni izpit
Predstavitve seminarske naloge

Delež (v %) /

Weight (in %)

Assessment:

Oral exam
Seminar presentation

Reference nosilca / Lecturer's references:

SPREITZER, Matjaž, MEDEN, Anton, SUVOROV, Danilo. High-temperature solid-state reactions in the $(1-x)\text{Na}_0.5\text{Bi}_0.5\text{TiO}_3-x\text{SrTiO}_3$ system. *Journal of the European ceramic society*, ISSN 0955-2219. [Print ed.], [in press] 2017, 8 str., doi: 10.1016/j.jeurceramsoc.2017.09.043. [COBISS.SI-ID 30961959]

FELIX, Anderson A., BEZZON, Vinícius, ORLANDI, Marcelo O., VENGUST, Damjan, SPREITZER, Matjaž, LONGO, Elson, SUVOROV, Danilo, VARELA, José A. Role of oxygen on the phase stability and microstructure evolution of $\text{CaCu}_3\text{Ti}_4\text{O}_{12}$ ceramics. *Journal of the European ceramic society*, ISSN 0955-2219. [Print ed.], 2017, vol. 37, no. 1, str. 129-136, doi: 10.1016/j.jeurceramsoc.2016.07.039. [COBISS.SI-ID 29680679]

DIAZ-FERNANDEZ, Daniel, SPREITZER, Matjaž, PARKELJ, Tjaša, KOVAČ, Janez, SUVOROV, Danilo. The importance of annealing and stages coverage on the epitaxial growth of complex oxides on silicon by pulsed laser deposition. *RSC advances*, ISSN 2046-2069, 2017, vol. 7, issue 40, str. 24709-24717, doi: 10.1039/C7RA02820B. [COBISS.SI-ID 30486055]

LI, Lei, SPREITZER, Matjaž, SUVOROV, Danilo. The microstructure, dielectric abnormalities, polar order and

microwave dielectric properties of $\text{Ag}(\text{Nb}_{1-x}\text{Ta}_x)\text{O}_3$ ($x = 0-0.8$) ceramics. Journal of the European ceramic society, ISSN 0955-2219. [Print ed.], 2016, vol. 36, no. 14, str. 3347-3354, doi: 10.1016/j.jeurceramsoc.2016.05.017. [COBISS.SI-ID 29547815]

JOVANOVIĆ, Zoran, SPREITZER, Matjaž, GABOR, Urška, SUVOROV, Danilo. Control of SrO buffer-layer formation on Si(001) using the pulsed-laser deposition technique. RSC advances, ISSN 2046-2069, 2016, vol. 6, issue 85, str. 82150-82156, doi: 10.1039/c6ra16311d. [COBISS.SI-ID 29705255].