

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	SODOBNE METODE SINTEZE V ANORGANSKI KEMIJI
Course Title:	ADVANCED METHODS IN INORGANIC SYNTHESIS

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
DR Kemijske znanosti, 3. stopnja	/	1.	1. in 2.
Doctoral programme in Chemical Sciences, 3 rd Cycle	/	1 st	1 st and 2 nd

Vrsta predmeta / Course Type: izbirni/Elective

Univerzitetna koda predmeta / University Course Code: KZ302

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individual Work	ECTS
/	/	/	/	75	75	5

Nosilec predmeta / Lecturer: izr. prof. dr. Barbara Modec /Dr. Barbara Modec, Associate Professor

Jeziki / Languages: Predavanja / Lectures: slovenski / Slovenian
Vaje / Tutorial: slovenski / Slovenian

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

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Prerequisites:

The course has to be assigned to the student.

Vsebina:

Študent s soglasjem mentorja izbere tiste metode, ki so najtesneje povezane z njegovim raziskovalnim delom. Nosilec predmeta in vodja študija poskrbita, da obseg študentovega dela ustreza 5 KT. Izvajanje koordinira nosilec. *Reakcije sintez:* pregled najpomembnejših reakcij in njihovih mehanizmov ter reagentov za pripravo anorganskih, koordinacijskih, organokovinskih in kovinsko-organskih spojin. Podrobnejša predstavitev nekaterih raziskovalnih dosežkov zadnjih let, ki so odprli nove možnosti na navedenemu področju. *Pregled zahtevnejših sinteznih tehnik:* sinteze v kontrolirani atmosferi, solvotermalna sinteza,

Content (Syllabus outline):

Student selects (in agreement with the supervisor) those topics that are mostly related to his research work. The course coordinator, who is in charge of the course, and the leader of the study take care that the student's workload corresponds to 5 credits. The whole process is coordinated by course coordinator. *Reactions:* outline of the important reactions and their mechanisms and reagents for the preparation of inorganic, coordination, organometallic and metalloid-organic compounds. Detailed study of some important research achievements that have opened new possibilities in the field.

sol-gel sinteza, sonokemične sinteze, termični razpad prekursorjev anorganskih spojin.

Advanced synthetic techniques, such as syntheses in the controlled atmosphere, solvothermal synthesis, sol-gel synthesis, sonochemical synthesis, thermal decomposition of precursors of inorganic compounds.

Temeljna literatura in viri / Readings:

- Catharine. Housecroft, Alan.G. Sharpe, Inorganic Chemistry, 4th Edition 2012, 3th Edition 2008, Pearson, Harlow, 40% od 1214 strani.
- F. Albert Cotton, Geoffrey Wilkinson, Carlos A. Murillo, Manfred Bochmann, Advanced Inorganic Chemistry, 6th Edition, Wiley, 1999, 10% od 1356 strani.
- J. Derek Woollins (urednik), Inorganic Experiments, 2nd Edition, Wiley, 2003, 25 % od 377 strani.
- Novejši pregledni članki iz znanstvenih revij. / Review articles.

Cilji in kompetence:

Študenti spoznajo zahtevne sintezne poti, reagente in tehnike za pripravo anorganskih, koordinacijskih, organokovinskih in kovinsko-organskih spojin ter za pripravo posebnih oblik teh snovi, kot so nanodelci, tanki filmi, snovi z visoko poroznostjo. Poudarek je na perspektivnih metodah, ki se naglo razvijajo.

Objectives and Competences:

Students acquire knowledge of advanced synthetic methods, reagents and techniques for the preparation of inorganic, coordination, organometallic and metallo-organic compounds, and for the preparation of compounds in the form of nanoparticles, thin films, porous material and other useful forms of matter. Particular attention will be given to the most promising methods.

Predvideni študijski rezultati:

Znanje in razumevanje

Poznavanje sodobnih sinteznih metod v anorganski kemiji omogoča sintezo novih in že znanih spojin, ki jih pripravljamo z namenom, da na njih študiramo zakonitosti o lastnostih in reaktivnosti snovi ali izkoriščamo njihove lastnosti v najrazličnejše namene

Uporaba

Anorganske snovi se sintetizirajo npr. za uporabo kot materiali, katalizatorji, reagenti za nadaljno sintezo, za elektrokemijsko uporabo, hranilnike energije. Razvoj na teh in sorodnih področjih zahteva tudi sintezo teh spojin.

Refleksija

Pomembno je zavedanje, da niso dosegljive samo snovi iz prodajnih katalogov, temveč tudi vse znane in mnoge še neznane snovi z morda presenetljivimi lastnostmi.

Intended Learning Outcomes:

Knowledge and Comprehension

Knowledge of modern synthetic methods in inorganic chemistry enables the synthesis of new and already known compounds, which are prepared to study the basic principles of properties and reactivity of compounds or to exploit properties of compounds in a wide variety of purposes.

Application

Inorganic substances are synthesized for example as materials, catalysts, reagents for further synthesis, for electrochemical use, the energy-storage materials. Developments in these and related areas requires the synthesis of inorganic compounds.

Analysis

It is important to recognize that not only material from commercial catalogs are available, but also all known and many unknown substances with perhaps surprising properties.

Prenosljive spretnosti

Pridobljeno znanje o tehnikah za sintezo anorganskih spojin je uporabno tudi pri sintezi drugih spojin, različni prijemi pa tudi na drugih področjih kemije.

Skill-transference Ability

The knowledge of the techniques of the synthesis of inorganic compounds is useful in the synthesis of other compounds, as well as in other areas of chemistry.

Metode poučevanja in učenja:

Individualne konzultacije, učenje tehnik v s praktičnim delom v laboratoriju.

Learning and Teaching Methods:

Individual consultations, practical work in the laboratory.

Načini ocenjevanja:

Priprava in predstavitev seminarske naloge ter njen zagovor; ustni izpit

Delež (v %) /

Weight (in %) **Assessment:**

Sem. 40 %
Izp. /Ex. 60 %

Preparation and presentation of seminar work, oral exam.

Reference nosilca / Lecturer's references:

1. COTTON, F. Albert, DIKAREV, Evgeny V., GU, Jiande, HERRERO, Santiago, MODEC, Barbara. Alkylpyridine complexes of tungsten(II) and chromium(II), First rotational isomers of $W_2X_4L_4$ molecules with D_{2h} and D_2 symmetries. *Inorganic chemistry*, ISSN 0020-1669, 2000, vol. 39, no. 23, str. 5407–5411.
2. MODEC, Barbara, BRENČIČ, Jurij, BURKHOLDER, Eric M., ZUBIETA, Jon. Novel molybdenum(V) squarato complexes based on the dinuclear metal–metal bonded unit: syntheses and structural characterization of dinuclear $[Mo_2O_4(C_4O_4)(R-Py)_4]$ and tetranuclear $[Mo_4O_8(C_4O_4)_4]^{4-}$. *Dalton transactions*, ISSN 1477-9226, 2003, no. 24, str. 4618–4625.
3. MODEC, Barbara, BUKOVEC, Peter. Solid state structures of dinuclear and trinuclear tungsten and molybdenum complexes with single metal–metal bonds. *Inorganica Chimica Acta*, ISSN 0020-1693. 2015, vol. 424, no. 1, str. 226–234.