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| **Course title**  Coordinative chemistry – ERASMUS  Chemia koordynacyjna – ERASMUS | | | **ECTS code**  13.3.1348 |
| **Name of unit administrating study**  Faculty Chemistry | | | |
| **Studies**   |  |  |  |  | | --- | --- | --- | --- | | **Field of study** | **Type** | **Form** |  | | Chemistry | Bachelor | Full-time studies |  | | Chemistry | Master | Full-time studies |  | | | | |
| **Teaching staff**  dr Krzysztof Żamojć | | | |
| **Forms of classes, the realization and number of hours** | | **ECTS credits 4**  classes 30 h  tutorial classes 20 h  student’s own work 50 h  TOTAL: 100 h - 4 ECTS | |
| 1. **Forms of classes, in accordance with the UG Rector’s regulations**   seminar | |
| 1. **The realization of activities**   In-class | |
| 1. **Number of hours**   30 h - seminar | |
| **The academic cycle**  summer | | | |
| **Type of course**  facultative | **Language of instruction**  English | | |
| **Teaching methods**  Seminar | **Form and method of assessment and basic criteria for evaluation or examination requirements** | | |
| **A. Final evaluation, in accordance with the UG study regulations**  course completion (with a grade) | | |
| **B. Assessment methods**  Writing test | | |
| **C. The basic criteria for evaluation** or exam requirements  Evaluation criteria in accordance with the UG Studies Regulations; | | |
| **Required courses and introductory requirements**  no requirements | | | |
| **Aims of education**  Systematic nomenclature of coordination chemistry. Application of known theories to explain problems of stereochemistry, spectroscopic properties and magnetic coordination compounds. Introduction to the subject matter related to the interpretation of the electronic absorption spectra of the coordination compounds of d-block metals based on the parameters of Slater-Condon-Shortley and Racah. Application of the molecular orbital theory to the description of bonds in complexes. | | | |
| **Course contents**  Introduction to Coordination Chemistry: survey of coordination numbers; stereochemistry, ligand types; dn configurations; elementary bonding theories; structure determination; nomenclature. Structural and Stereoisomerism: types of structural isomers; types of stereoisomers (cis and trans; mer and fac; sym and asym; optical isomers). Symmetry and Point Groups: determination of symmetry elements and operations; molecular point group determination; symmetry and dipole moment and chirality. Synthetic Reactions: addition, substitution, dissociation, redox, and reactions of coordinated ligands; catalytic processes; inertness and lability; chelate effect; trans-effect; reactions in non-aqueous media. Crystal field theory: Magnetic properties and CF stabilization energy; electronic absorption spectra; spectrochemical series; Jahn-Teller effect; thermodynamics and crystal field effects. Term symbols. Slater-condon parameters for atoms and ions of the first transition period. Special Topics in Coordination Chemistry: metal-metal bonds; solar energy conversion. Calculations using Orgel diagrams, Explain the difference between Orgel and Tanabe-Sugano diagrams. Mechanisms of ligand substitutions, small molecule activation and transition metal-catalysed reactions will be discussed | | | |
| **Bibliography of literature**  Coordination Chemistry Reviews | | | |
| **Knowledge**  By the end of the course, the student must be able to: Recall typical ligands; name typical coordination compounds and describe their geometry Judge the existence of isomers and draw such isomers; Calculate the oxidation states of metals and the number of d electrons. Apply soft-hard acid-base theory to predict the stability of complexes; interpret chelate effect; determine the relative stability of complexes according to structural factors. Deduce the crystal field splitting diagram for octahedral, tetrahedral, and square planar complexes; decide the electronic configuration. Generate the ligand field diagram for octahedral complexes. Decide if a complex is high spin or low spin using ligand field theory; understand and explain the spectrochemical series. Estimate the spin-only magnetic moment of complexes according to ligand field theory; Determine whether an electronic transition is allowed and the intensity of such transition. Describe various metal-ligand interactions in terms of sigma- and pi-bonding interactions. Explain the stability of d-metal complexes, their reactivity, and the mechanisms of ligand substitution reactions | | | |
| **Skills**  Skills to solve problems related to coordination chemistry. Skills to solve problems related to structural coordination chemistry. Skills to solve problems related to the reactivity of complex compounds. Skills to solve problems associated with spectroscopy and magnetism in complexes. The general skills that should be acquired by the student and in which the course aims at are: Search, analysis and synthesis of data and information and making decisions. Turning theory into practice. Promotion of free, creative and inductive thinking. Independent and teamwork. Acquisition of the appropriate theoretical and practical knowledge base to enable the further training both in theory (in more specific subjects of Coordination Chemistry) and in laboratory. | | | |
| **Social competence**  Search for, analysis and synthesis of data and information, with the use of the necessary technology. Adapting to new situations. Decision-making. Working independently. Team work. Working in an interdisciplinary environment. Production of new research ideas. Showing social, professional and ethical responsibility criticism and self-criticism. Production of free, creative and inductive thinking | | | |