Level: Master academic studies of chemistry

Course title: Advanced Analytical Chemistry (IHA-509)

Status: Elective

ECTS: 8

Requirements: None

Learning objectives

- Expanding the previously acquired knowledge on acid-base equilibria in aqueous and nonaqueous systems.
- Introducing students to interaction id multicomponent homogenous systems.
- Enabling students to apply nonaqueous solvents and their mixtures with ionic liquids in analytical and separation procedures.
- Enabling students for independent solving of complex problems related to nonaqueous and concentrated solutions.
- Enabling students to apply mathematical and data processing methods in explanation of various factors on physical and chemical properties of real solutions.

Learning outcomes

Students should be able to:

- list and explain interactions in multicomponent homogenous equilibria;
- solve complex problems related to acid-base equilibria in solutions;
- explain the impact of some physical parameters (temperature, pressure, etc.) and individual components on physico-chemical characteristics of complex mixtures;
- apply mathematical equations and computer programs in calculation of basic physico-chemical properties of solvents;
- adequately operate instruments for measuring physical and chemical characteristic of multicomponent systems.

Syllabus

Theoretical instructions

Acid-base equilibria; proton condition, ionic strength, activity of ions, K^a and K^c, mixtures of acids and bases, polyprotic acids, zwitterions, semi-logarithmic diagrams. New acid-base theories.

Concentrated solutions: Debye-Hückel theory, interactions in concentrated solutions, Hammet function.

Non-aqueous systems: Acidity and basicity of non-aqueous solvents, solvation process, ionic pairs, mixtures of solvents, pS-scale, influence of water, determination of water in non-aqueous solvents. Molten salts, ionic liquids.

Practical instructions

Determination of water (Karl-Fischer titration). Determination of weak base in non-aqueous solution. Physico-chemical characterization of ionic liquids. Mixtures of ionic liquids and molecular solvent.

Weekly teaching load				Other: /
Lectures: 3	Exercises: 3	Other forms of teaching: 2	Student research: /	