

## Thesis topics

### Department of Inorganic and Analytical Chemistry

2022/2023. academic year I. semester

**Supervisor: Prof. Attila Gáspár**

#### **Determination of phenolic compounds using CZE-MS**

Chemistry BSc, Chemical Engineering BSc, Chemistry MSc and Chemical Engineering BSc majors  
filled already

The following research projects are for Hungarian and International Students of Chemistry and Chemical Engineering B.Sc. and M.Sc. majors.

**I.) Sorption of aqueous heavy metal ions on aerogel sorbents** 2 persons

**Supervisors: Dr. Petra Herman, Dr. József Kalmár**

- Solid and aqueous phase characterization of aerogels (particles size distribution, Zeta potential, IR, N<sub>2</sub> porosimetry).
- Selectivity of aerogel sorbents towards aqueous heavy metal ions or dyes.
- Equilibrium and time resolved batch sorption experiments.
- Quantitative analysis by ICP-OES or spectrophotometry.
- Aerogel sorbents for the remediation of aqueous ecosystems (Paramecium and Daphnia).

**II.) Hydration induced structural changes in porous materials** 2 persons

**Supervisors: Dr. Attila Forgács, Dr. József Kalmár**

- Measurement of hydration properties of aerogel samples with NMR techniques.
- Understanding the changes in structural properties at different water contents.
- Equilibrium and time resolved batch sorption experiments.
- Developing mechanistic models for hydration.

**III.) *Synthesis and characterization of gelatin, and cross-linked gelatin aerogels*** 2 persons

**Supervisors: Dr. Attila Forgács, Dr. József Kalmár**

- Synthesis of new types of gelatin and cross-linked gelatin aerogels.
- Aerogel characterization (SEM, N<sub>2</sub> porosimetry, elemental analysis).
- Measurement of flexibility and mechanical strength.

**IV.) *Synthesis and characterization of polymer aerogels*** 2 persons

**Supervisors: Krisztián Moldován, Dr. József Kalmár**

- Synthesis of polymer aerogels.
- Characterization of dry aerogel (SEM, N<sub>2</sub> porosimetry, IR, mechanical properties).
- Aqueous phase characterization of aerogels (particles size distribution, Zeta potential).
- Application oriented testing of aerogels.

**V.) *Synthesis and characterization of borosilicate aerogels for tissue regeneration*** 2 persons

**Supervisors: Zoltán Balogh, Dr. József Kalmár**

- Synthesis of Ca(II)-containing borosilicate aerogels.
- Aerogel characterization (SEM, N<sub>2</sub> porosimetry, IR).
- Aqueous phase characterization of aerogels (particles size distribution, Zeta potential).
- Improving synthesis conditions to enhance biological effect.