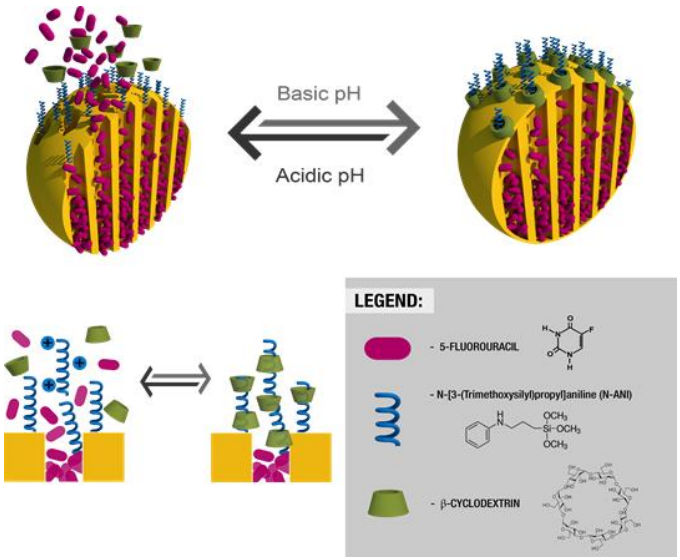
INORGANIC CHEMISTRY

Heteroleptic iron triad's complexes as magnetic materials.
supervisor: doc. RNDr. Juraj Kuchár, PhD. (juraj.kuchar@upjs.sk)
consultant: RNDr. Miroslava Matiková Maľarová, PhD.
study form: full time
Annotation: Coordination compounds based on iron, cobalt and nickel in common oxidation states are intensively studied due to their interesting magnetic properties. These properties depend on several factors such as the oxidation state of the central atom, the shape of its coordination polyhedron, the character of the donor atoms or the dimensionality of the crystal structure. According to these facts, the dissertation is focused on the study of preparation, chemical and spectroscopic characterization and crystal structure of heteroleptic iron triad's complexes. Tuning the strength of the ligand field will be achieved by combining halogenido ligands (starting salts) with different chelating ligands mainly with O- and N-donor atoms or Schiff base type; the latter will be synthesized within the dissertation. Magnetic properties of selected coordination compounds will be studied.

Cytotoxic complexes with 8-hydroxy-2-quinolinecarboxylic acid derivatives.
supervisor: doc. RNDr. Ivan Potočňák, PhD. (ivan.potocnak@upjs.sk)
study form: full time
Annotation: The thesis is a continuation of our long-time research focused on the preparation of cytotoxic complexes containing 8-hydroxyquinoline derivatives. The aim of the thesis is preparation of 8-hydroxy-2- quinolinecarboxylic acid derivatives and subsequently to prepare and characterize (IR, UV-VIS, NMR, elemental analysis, thermal analysis, X-ray structure analysis) complexes of selected metals with these derivatives, which are able to intercalate to the DNA and thus enable to exhibit antiproliferative activity of the prepared complexes. This will be assessed against selected tumor cell lines. On the basis of the knowledge on the composition, structure and biological properties of the prepared compounds new compounds will be prepared and characterized in order to modify their structure and therefore their antiproliferative activity.

Influence of metal ions coordination sphere on their antimicrobial, cytostatic and toxic effect.
supervisor: doc. RNDr. Zuzana Vargová, PhD. (zuzana.vargova@upjs.sk)
study form: full time
Annotation: Thesis is focused on monitoring of influence of N, O, S-donor ligands coordination ability on biological activity and toxic effect of selected predominantly soft metal ions. The aim of the thesis is to determine their influence on metal ion function in the process of pathogenic microorganisms growth inhibition and their selectivity against beneficial microorganisms (potential antimicrobial agents with additional cytostatic effect) as well as in the process of reducing its toxic effect on the environment (potential chelating agents).

Nanoporous silica particles for targeted drug delivery.
supervisor: prof. RNDr. Vladimír Zeleňák, DrSc. (vladimir.zelenak@upjs.sk)
study form: full time
Annotation: The thesis is a follow-up to several years of research focused on the development of new intelligent drug delivery systems releasing bioactive substances in a targeted way by the influence of physical or chemical stimulus [1-3]. The theme of the PhD thesis is based on this knowledge and concept and its motivation is to design, prepare and test inorganic porous carriers based on silica matrix, transporting the drug to cancer cells by active targeting. For this purpose, the silica nanoparticles will be modified with ligands 4 (e.g., folic acid derivatives) that, due to the specific ligand-receptor interactions on the surface of the cancer cell, allow preferential binding and internalization of such systems by cancer cells.



Porous materials for environmental applications.
supervisor: prof. RNDr. Vladimír Zeleňák, DrSc. (vladimir.zelenak@upjs.sk)
consultant: RNDr. Miroslav Almáši, PhD.
study form: full time
Annotation: The dissertation thesis builds on longtime research in the field of development and application of porous materials. The aim of the dissertation is the preparation of porous materials for efficient capture and storage of heavy metals and photocatalytic degradation of drug molecules from wastewater. In the first step, the design and synthesis of a porous material will be proposed. The surface of porous material will be post-synthetically modified with ligands with high affinity for efficient storage of selected heavy metal ions or drugs. In the case of drug capture, the porous material will be additionally modified with photoactive nanoparticles, the function of which will be the photocatalytic degradation of the captured drug molecules by UV radiation.