

INORGANIC CHEMISTRY

Heterospin coordination compounds.

supervisor: prof. RNDr. Juraj Černák, DrSc.

study form: full time

Annotation: Within the quest for new high density data storage media will be within the planned thesis studied new complexes containing magnetically active central atoms based on combination of selected 3d- and 4f-metals, or organic radical TCNQ⁻, respectively. It is expected that the prepared mononuclear or oligomeric complexes will belong to the class of single-molecule magnets. During syntheses several parameters like structural dimensionality, nuclearity and shape of the coordination polyhedra will be tuned by suitable choice of ligands. Emphasis will be done on the preparation of the compounds in the single crystal form. Prepared complexes will be characterized by chemical and spectroscopic methods, and their crystal structures will be elucidated. Results of experimental magnetic studies will be correlated with the results of structure analyses.

Complexes with anti-cancer activity based on planar ligands.

supervisor: doc. RNDr. Ivan Potočný, PhD.

study form: full time

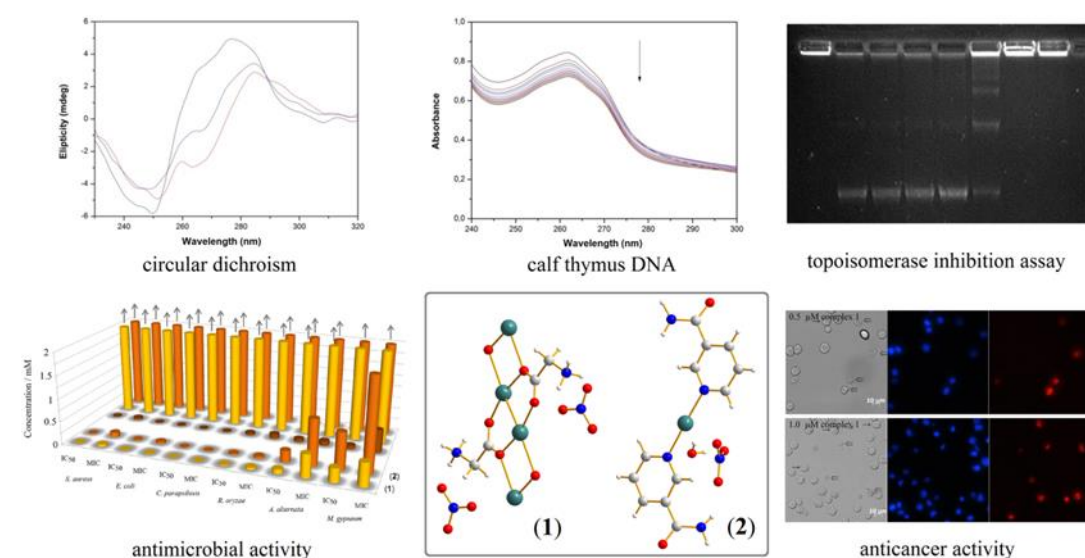
Annotation: The aim of the thesis is to prepare and characterize (IR, UV-VIS, NMR, elemental analysis, thermal analysis, X-ray structure analysis) complexes of selected transition metals with both commercially available and synthesized planar N- and O-donor ligands, which are able to intercalate to the DNA and thus enable to exhibit anti-tumor activity of the prepared complexes. This will be assessed by MTT assays against selected tumor cell lines. On the basis of the knowledge on the composition, structure and biological properties of the prepared compounds to prepare and characterize new compounds in order to modify their structure and therefore their anti-tumor activity.

Silver and zinc complexes with potential biological activity.

supervisor: doc. RNDr. Zuzana Vargová, Ph.D.

study form: full time

Annotation: Increasing antimicrobial drug resistance encourages chemists, namely in the field of bioinorganic chemistry to search for new forms of treatment against pathogenic microorganisms. The underlying idea is to connect antimicrobial metal (Zn(II), Cu(II), Ag(I)) and efficient organic ligand into a new synergic drug. The fundamental idea of PhD study will be preparation and characterization of new silver (I) and zinc(II) coordination compounds and selected samples will be tested by relevant antimicrobial and anticancer techniques (Figure).



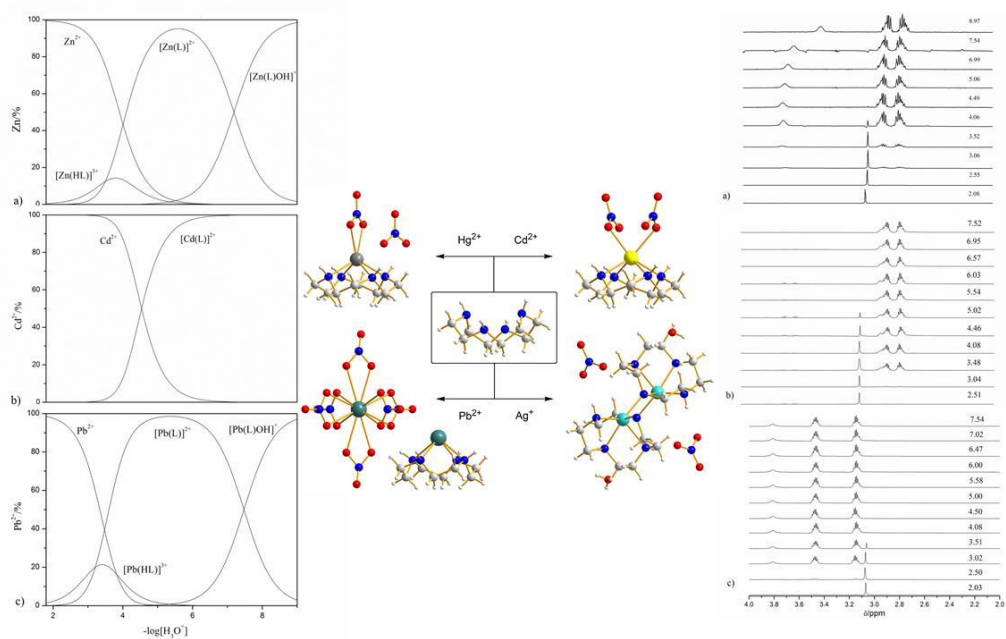
Obrázok: Rendošová, M., Vargová, Z.*, Kuchár, J., Sabolová, D., Levoča, Š., Kudláčová, J., Paulíková, H., Hudecová, D., Helebrandtová, V., Almáši, M., Vilková, M., Dušek, M., Bobál'ová, D., New silver complexes with bioactive glycine and nicotinamide molecules – Characterization, DNA binding, antimicrobial and anticancer evaluation, *Journal of Inorganic Biochemistry*, 168 (2017) 1-12.

Potential toxic metal ions chelating agents based on N, O, S - donor ligands.

supervisor: **doc. RNDr. Zuzana Vargová, Ph.D.**

study form: full time

Annotation: The heavy metals presence in many ecosystems as a consequence of mutual natural and anthropogenic activities leads to the inevitable need to remove these metals from the environment. Consequently, some research fields such as chemistry (in collaboration with ecology or biology) suggest possible solutions. One of the most promising solutions is the preparation of new biodegradable chelating agents based on N, O, S - donor ligands to eliminate the amount of toxic metal ions from the environment. The underlying idea will be the study of the complexing properties of the ligands as potential new chelating agents in the solution as well as the isolation of the new metal ionic coordinating compounds (Cd^{2+} , Hg^{2+} ,



Pb^{2+} , Ag^{+}
etc.) and their characterization (Figure)

Obrázok: Litecká M., Gyepes R., Vargová Z.*, Vilková M., Almáši M., Walko M., Imrich J. Toxic metal complexes of macrocyclic cyclen molecule - synthesis, structure and complexing properties, *Journal of Coordination Chemistry*, 70 (2017) 1698-1712

Novel metallo-organic frameworks for sorption and catalytic applications.

supervisor: **doc. RNDr. Vladimír Zeleňák, Ph.D.**

study form: full time

Annotation: The thesis focuses on study of the preparation of novel metal-organic frameworks (MOFs) with open porosity, based on transition and inner transition metal cations as central atoms and different porphyrin molecules as ligands. The aim of the work will be optimization of the preparation of MOFs, study of their structure, thermal stability and activation conditions. In addition to detailed characterization of prepared MOFs, the work will focus on investigation of the possible applications of the prepared compounds for sorption and storage of technologically important gases such as hydrogen and carbon dioxide or, on investigation of their application in catalysis of selected, technologically important reactions.

