8. Abstract

Coordination networks are a group of coordination compounds that include both single-core and multi-core systems, coordination polymers as well as metal-organic frameworks (MOF). These compounds are a combination of inorganic and organic building units that constitute a new generation of functional materials with possible applications as gas separators and gas storage, sorbents of toxic substances, functional materials with catalytic, luminescent, magnetic properties and up to components of hybrid materials, among others.

Depending on what features the metallic and organic building blocks will have, different coordination networks can be obtained, which will have appropriate structural and physicochemical properties. Learning about the coordination capabilities of the synthesized new amino-carboxylates with respect to the metal center mainly Cu(II) is a new contribution to the study of metal-organic combinations.

The dissertation focuses on the synthesis and characterization of new coordination networks based on amino-carboxylic ligands with copper(II) ions. The description of the results and their discussion is preceded by a brief introduction on metal-organic networks including analysis of structural elements.

At the start, as part of the thesis, the objectives and methodology of the research were defined. Some of the most important research problems during the execution of the work were the optimization of solvothermal synthesis processes in the Berghof BF 100 reactor in order to achieve the best possible reproducibility and efficiency, as well as the roentgenostructural characterization of the obtained metal-organic compounds involving the determination of their chemical composition, the environment of the central ion and the mode of coordination by the ligands used. New coordination compounds, coordination polymers from 1D to 3D, were prepared by solvothermal route. Each of the compounds was obtained as monocrystals by slow crystallization processes in the Berghof reactor.

On the basis of studies conducted by spectroscopic and diffractometric methods, the structure of individual coordination networks was determined. The amino carboxylates used in the complexation process were generally deprotonated, and the resulting linker ligands showed different denticity. Coordination of the central atom occurred with the participation of the carboxyl group and the nitrogen of the aromatic

rings, which was reflected in infrared spectra. Carboxyl groups of ligands where pyridines and especially pyrazines are attached to the quinoline ring form coordination polymers with 1D to 3D dimensionality. In some cases, these compounds crystallize in the form of hydrates or with a H_2O molecule in the coordination sphere, which further stabilizes the structures of metal-organic networks by participating in hydrogen bonds and intermolecular interactions.

The primary goal in the final phase of the experimental research was to relate the structural properties to the magnetic properties for the obtained connections toward possible applications.

The presented PhD dissertation undoubtedly expands the state of existing knowledge on new amino-carboxylate building block combinations, which, thanks to their specific coordination-structural properties, can be used with great success for the synthesis of new metal-organic structures, coordination polymers with other d-block metals with new interesting structural and application properties.