Structure and properties of N,O-donor bicyclic derivatives of imidazoleacetic acid and their complexes with selected d-block metal ions

In the last decades bicyclic imidazole derivatives had been gaining substantial interest both in the field of modern organic synthesis, as well as their potential application as biologically active compounds. The increased interest in this particular group of compounds has been made possible mostly due to development of advanced synthesis methods. Bicyclic derivatives of imidazole are also an attractive group of ligands for d-block metal ions, however the coordination chemistry of these class of compounds has received a little attention and only a few reports are available in the literature to date. The main goal of this dissertation is to investigate the structure and properties of four derivatives of imidazoleacetic acid, namely, (imidazo[2,1-*b*]thiazol-6-yl)acetic acid (H*ITZ*-6-ac), (imidazo[1,2-*a*]pyrimidin-2-yl)acetic acid (H*IPM*-2-ac), (imidazo[1,2-*a*]pyridin-2-yl)acetic acid (H*IP*-2-ac) and (imidazo[1,2-*a*]pyridin-3-yl)acetic acid (H*IP*-3-ac) as well as their complexes with selected d-block metal ions. Specifically, a purpose of this project is to demonstrate to which extent the chemical nature of the aromatic ring (compounds H*ITZ*-6-ac, H*IPM*-2-ac, H*IP*-2-ac) and the position of the acetate group on the imidazole ring (isomers H*IP*-2-ac, H*IP*-3-ac) imply the properties of ligands and their ability to form coordination compounds.

In the course of investigations, all ligands were structurally characterized by means of single-crystal X-ray diffraction and spectroscopic FT-IR, FT-Raman and NMR methods. Moreover, 19 new crystalline complexes of Mn(II), Co(II), Ni(II), Zn(II) and Cd(II) were successfully synthesized and structurally characterized. The majority of the obtained coordination compounds (13) are mononuclear octahedral complexes of the type Ma2b2c2, which crystallize either as dihydrates (complexes based on *ITZ*-6-ac and *IP*-2-ac anions) or in non-solvated forms (complexes based on *IPM*-2-ac anion). The impact of chemical nature of the ring fused with imidazole ring on  stereochemical preferences of ligands in the Ma2b2c2 type complexes is demonstrated.

Furthermore, two five-coordinate Zn(II) complexes based on *ITZ*-6-ac and *IP*-2-ac anions and trinuclear Zn(II) complex based on *IP*-2-ac anion were obtained whereas the (imidazo[1,2-*a*]pyridin-3-yl)acetic acid was demonstrated to form a series of isomorphous coordination polymers with Mn(II), Co(II) and Ni(II) ions.

All coordination compounds were characterized by means of spectroscopic (FT-IR, FT-Raman) and  thermal methods. Additionally, ligands and selected coordination compounds were subjected to microbiological tests in order to determine their antimicrobial activity.