ABSTRACT

In the body metal ions play an important role in the regulation of many biological functions. Besides, there exists numerous active pharmaceutical ingredients (API), containing also metal ions, for various therapeutic and diagnostic applications. The approval of cisplatin in 1970's, the first platinum-based anticancer drug, which together with some other platinum complexes still remains one of the leading compounds for the cancer treatment, has further triggered tremendous interest for the research of the coordination compounds. However, the application of platinum complexes is limited due to their severe unwanted side effects and development of the drug resistance. Therefore, the design of the improved anticancer APIs is of the utmost importance. Among other compounds ruthenium coordination compounds represent an alternative to such platinum complexes. Ruthenium(III) complex NKP1339 and ruthenium(II) complex TLD1433 have both already entered clinical trials and have shown encouraging anticancer outcomes. Besides, ruthenium complexes are well-researched also for other therapeutic applications. Furthermore, ruthenium coordination compounds as well as other transition metal complexes are often also applied as photocatalysts in biological systems and even more extensively in organic and inorganic chemistry due to their physico-chemical properties.

We have prepared various organoruthenium(II) i) chlorido, ii) pta (1,3,5-triaza-7-phosphaadamantane) and iii) *N*-heterocyclic carbene complexes with pyrithione (1-hydroxypyridine-2(1*H*)-thione) and its analogues. Additionally, we have performed the synthesis of iv) ruthenium(II) carbonyl complexes and prepared some v) zinc(II), vi) copper(II), vii) nickel(II) and viii) ruthenium(II) polypyridyl coordination compounds. Complexes have been physico-chemically characterized by NMR, UV-Vis and IR spectroscopy, HRMS spectrometry, CHN elemental analysis and in case of the suitable crystals also by single-crystal X-ray diffraction. For certain compounds stability studies in biologically relevant aqueous media were also carried out. Organoruthenium(II) complexes have been characterized for their anticancer properties as well as some of them also for their potential implication for the treatment of neurodegenerative diseases. Besides, for some coordination compounds with pyrithione and its analogues also photooxidative and photoreductive catalytic activity has been examined.

Key words: (organo)ruthenium(II) coordination compounds, transition metal complexes, pyrithione, anticancer activity, antineurodegenerative activity, photooxidation, photoreduction.