

1. The objective of the project

The aim of the project submitted for assessment is the synthesis and physico-chemical and biomedical characterization of transition metal complexes with polycarboxylate and auxiliary, biogenic (*e.g.* aromatic nitrogen bases), ligands. This type of low molecular weight complexes will be tested for the antioxidant activity will be determined by physico-chemical and biomedical (fibroblast cells) methods. These compounds may play the role of superoxide dismutase (SOD) mimetics, whose task is to reduce superoxide anion constituting the most common risk factor in an oxidative stress. The results obtained will be a valuable source of information for chemists, and clinicians and biomedics due to the possibility of creating a variety of physical and chemical properties (optical, magnetic and catalytic) of complexes by an appropriate choice of ligands.

2. Description of the research to be carried out.

In the first step of project realization, the coordination compounds of Cu^{2+} , Co^{2+} and VO^{2+} with anionic ligands of polycarboxylic acids as well as selected biogenic ligands. Selected ligands for synthesis, such as the polycarboxylate anions, pyridoxine, pipydoxamine, quinoline, and other aromatic nitrogen bases, have interesting biological and complexing properties. Complex formation constants, thermodynamic parameters of the formation of complex compounds and stoichiometry will be determined using a isothermal titration calorimetric technique, an UV-Vis spectrophotometry and a potentiometric method. A cyclic voltammetry method and the NBT (nitro blue tetrazolium salt) test will be used to determine the ability of the complex to the removal of reactive oxygen species such as a superoxide anion. Moreover, the antioxidant properties towards the organic radicals will be determined using the DPPH and ABTS assays. The biomedical properties of the complexes will be investigated in relation to its cytoprotective properties by the MTT and LDH tests based on the Hippocampal neuronal cell line - HT22 during the oxidative stress induced by hydrogen peroxide.

3. Reasons for choosing the research topic

The role of superoxide dismutase is to remove the excess of superoxide anion. Many years ago the relationship between the superoxide superoxide dismutase deficiency and various serious diseases was noticed. The invented and used in therapies to cover the deficiency of antioxidants in the body enzyme preparations exhibited unfavorable pharmacokinetic and pharmacodynamic properties due to the high value of the molecular weight and the charge density. So scientists still intensively look for low molecular weight compounds that would show the activity of superoxide dismutase. On the basis of obtained research results it will be possible to select appropriate complex compounds that may play a role of superoxide dismutase mimetics, which enzyme plays an important role in many diseases, such as neurodegenerative, cardiovascular, diabetes, and chronic inflammation. Furthermore, the use of synthetic antioxidants may be a new way to protect the properly functioning tissues during therapies, at the same time not reducing their effectiveness. Therefore it is reasonable to conduct the research aimed at finding new and also low molecular weight compounds having superoxide dismutase activity. The results of the research project proposed will constitute an important contribution to the development of modern medicine since nowadays scientists intensively look for new cytoprotective substances of the increasing efficiency and selectivity.