The phenomenon of magnetism fascinated mankind for thousands of years, since the ancient Greeks observed, that some of the physical bodies have unusual ability for mutual magnetic attraction. The origin of the words "magnetism" or "magnet" should be searched in the ancient city of Magnesia. The city, now known under the name of Manisa, was a primary source for mysterious stones that could attract or repel each other. The famous Greek philosopher – Thales of Miletus – described the attraction of iron to magnetite and tried to explain this phenomenon belief, that magnetite has a soul. Shortly after, the Chinese have described the magnetic needle and legends include the information that the first compasses constructed in the Middle Kingdom were used to construction of the building in accordance to *feng shui*. Magnetism was accompanied by a man almost always, but the process of understanding this phenomenon lasted for a relatively long time. During the last century, in this field of magnetism there was a large increase of knowledge and available technology solutions. Currently, the greatest interest is associated with branch of chemistry called “molecular magnetism”, which focuses on searching new magnetic materials.

The cobalt(II) complexes as a new magnetic material: SIM or SCM systems, are the subject of this project. The main goal of the project is to obtain and characterize this very attractive and promising functional materials, because a Single Ion Magnets (SIM) and Single Chain Magnets (SCM) exhibit a long time of relaxation in conjunction with high magnetic anisotropy of Co(II) cation. The SIM and SCM systems, which are the main topic of proposed project, belong to the family of well known Single Molecule Magnets (SMMs). The field of SMMs, started with the $[Mn_{12}O_{12}(OAc)_{16}(H_2O)_4]\cdot 2H_2OAc\cdot H_2O$, which was published by professor Tadeusz Lis in 1980. The Single–Chain Magnets are made up of magnetically isolated chains possessing a finite magnetization that can be frozen in the absence of an applied magnetic field. At low temperatures, the relaxation of the magnetization becomes so slow ($\tau > 1s$), that these systems can be considerate as a magnet. In 2003, Caneschi and co–workers reported the first example of slow relaxation in a one–dimensional coordination polymer $[Co(hfac)_2(NITPhOMe2)]$, suggested the name Single Chain Magnets for such systems. This complex is composed of alternating $Co(hfac)_2$ and radical moieties arranged in 1D arrays with a helical structure parallel to (001) direction. The ac measurements show increasing of relaxation time with decreasing of temperature – when T decreases from 15 K to 4 K relaxation time increases by 10 orders of magnitude. Two year later, in 2003, Ishikawa et al. observed slow magnetic relaxation in the single-ion magnet (SIM) bis(phthalocyaninato)terbium(III), which contains a single paramagnetic Tb3+ ion. Since then, several SIMs containing Fe(II) ions has been reported, but in the literature are also publications containing information about slow relaxation of magnetization in cobalt(II) complexes.

The SIMs and SCMs system belong to the group of intensively investigated materials due to their interesting physical properties and the expected technological application.