

Brno University of Technology**Central European Institute of Technology BUT****Supervisor's report**

Academic year: **2023/2024**

Student: **Ing. Jana Juráková**

Doctoral programme: **Advanced materials and nanosciences**

Field of study: **Advanced nanotechnologies and microtechnologies**

Supervisor: **doc. Ing. Ivan Šalitroš, DSc.**

Title of PhD thesis: **COORDINATION COMPOUNDS SHOWING THE MAGNETIC BI- OR MULTISTABILITY**

Overall evaluation of doctoral thesis and study of the doctoral student:

Jana Juráková's Ph.D. research primarily focused on the synthesis of Co(II)-based Single Molecule Magnets (SMMs), along with their analysis and the preparation of hybrid materials through the deposition of SMMs on silicon surfaces.

The submitted Ph.D. thesis is structured into seven chapters and an appendix. Chapter 1 (3 pages) serves as an introduction to the thesis theme, providing a timeline of research on Single Molecule Magnets (SMMs) along with future prospects. While the thesis primarily focuses on the synthesis and experimental characterization of prepared coordination compounds, grasping their magnetic properties necessitates a foundational understanding of molecular magnetism theory, which is elucidated in the second chapter (12 pages).

The State-of-the-art chapter provides a review of some of the most notable studies focused on the design and synthesis of novel Co(II) Single-Ion-Magnets using various synthetic approaches, as well as investigations into their magnetic properties. This chapter was initially included in the author's doctoral preliminary thesis and subsequently published as a review article, which is attached in appendix of the Ph.D. thesis. Chapter 4 outlines the objectives of the thesis, while Chapter 5 (10 pages) provides detailed synthetic protocols for the reported coordination compounds along with the theoretical background of methods used for their characterization.

Chapter 6 (46 pages), entitled as Results and Discussion, is subdivided into two sections, each focusing on a distinct family of Co(II) Single-Ion-Magnets. These families feature similar tridentate N-donor ligands, derivatives of 2,6-bis(1*H*-benzimidazole-2-yl)pyridine (*bbp*) and 2,6-bis(pyrazole-1-yl)pyridine (*bpp*), respectively. Overall, the thesis reports eleven Co(II) coordination compounds with *bbp* ligands and nine with *bpp* ligands. All reported compounds were characterized by conventional analytical techniques, their structures confirmed by single-crystal X-ray diffraction analysis and their magnetic properties were investigated by static and dynamic magnetic measurements. Magnetic properties of selected examples were also characterized by high-field electron paramagnetic resonance and Fourier-transform infrared magnetic spectroscopy. In addition to magnetic investigation, two Co(II)-SIMs were successfully deposited onto surfaces in logical structures using wet lithography techniques. Chapter 7 (5 pages) contains the summarisation of the main results and conclusions drawn from the obtained results. Additional parts of the PhD thesis include References, his publication and output records, and Appendices.

The submitted thesis is well written and extensively documented. The hypotheses and arguments are

meticulously formulated, drawing on valuable and up-to-date literature. The conclusions reached are compelling and supported by the evidence presented throughout the thesis. Overall, the conclusions affirm that the objectives of the work have been successfully achieved. The significance of the obtained results is further validated by their six publications in prestigious international scientific journals.

During the PhD studies, Jana Juráková made significant personal and professional progress. She is well skilled in the organic, inorganic and coordination synthesis of transition metal complexes, their structural and magnetic analysis. She is also well skilled in writing scientific publications with minimal guidance. She worked in several international teams during her studies and communicated her results with others. She was also interacting with other researchers from the chemistry laboratory on interdisciplinary tasks. During the Ph.D. study, Jana Juráková attended several long-term research stays in the international prestigious groups of prof. Mario Ruben (KIT Karlsruhe), prof. Eugenio Coronado (University of Valencia) or prof. Azzedine Bousseksou (University of Toulouse).

In my opinion, the submitted Ph.D. thesis **fulfils** all requirements posed in theses aimed at obtaining a PhD degree. I consider the thesis ready to be orally defended in front of the respective committee.

In Brno
16.02.2024

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Assoc. Prof. Ing. Ivan Šalitros, DSc.