

## Summary

In this work, I focus on the synthesis, spectroscopic characterization, and optical properties of: (1) multidonor macrocyclic Schiff bases, (2) benzimidazole derivatives modified with substituents of different electronic properties, and (3) macrocyclic zinc(II) and copper(II) complexes. As a result of the conducted studies, two macrocyclic ligands [2+2], two macrocyclic ligands [3+3], five benzimidazole ligands modified with substituents: -bromo, -phenyl, -methyl, -*tert*-butyl group and naphthoimidazole as well as two macrocyclic zinc(II) complexes and two macrocyclic copper(II) complexes were obtained. Spectroscopic characterization of the obtained compounds was carried out in solution and the solid state using the following methods: NMR, IR, UV-Vis, elemental analysis, thermal analysis, X-ray structural analysis, and intermolecular interactions were determined by Hirshfeld surface analysis. In addition, DFT calculations of the structural and optical properties of the compounds were performed.

The wet spin coating and thermal vapour deposition methods were used to obtain thin materials, and the deposition parameters were optimised. The materials were characterized using microscopic methods: SEM/EDX, AFM, and TEM. Optical properties of thin films were studied.

The fluorescent properties of the obtained compounds in solution and the solid state were also determined to qualify the materials as OLED precursors. Five OLEDs were constructed using benzimidazole ligands, which act as the emission layer of the resulting optical device. The diode parameters were determined, i.e., the maximum wavelength of electroluminescence emission, initial voltage, maximum brightness, current efficiency, and active layer thickness. High lighting parameters were confirmed, which results in the possibility of their use in industry.