

Metal-Organic Frameworks (MOFs) are a class of porous coordination polymers that consist of inorganic nodes and organic linkers. These materials are characterized by high specific surface area, and by choosing the appropriate building blocks, it is possible to design their structure and physicochemical properties. Post-synthetic modifications of MOFs allow for their further functionalization, expanding their possible application in various research areas such as heterogeneous catalysis, separation processes, and biomedical applications.

As part of the doctoral thesis, studies on post-synthetic modifications of selected MOFs were conducted, which included functionalization of both inorganic nodes and organic linkers. The aim of the designed functionalization strategies was to test the possibility of giving them new functions in selected three main research areas. These topics included: (1) catalytic synthesis of cyclic carbonates under mild reaction conditions, (2) synthesis of polymer@MOF hybrids based on radical polymerization of acrylic monomers, and (3) sorption studies on series of flexible MOFs. The results of the conducted experimental and theoretical studies confirmed the effectiveness of the proposed strategies of modification of nodes or linkers and allowed for the precise determination of their properties and further verification of possible applications in heterogeneous catalysis.

The doctoral thesis begins with a literature review on the topic of porous materials, their classification, and possible applications, with particular emphasis on MOFs and their post-synthetic modifications. The results of the conducted research are divided into three chapters, where studies related to obtaining a series of bifunctional catalysts used in the cycloaddition of CO<sub>2</sub> to epoxides, the development of strategies for obtaining polymer@MOF hybrids based on radical polymerization of acrylic monomers, and sorption studies of flexible networks of the JUK 20 series are discussed, respectively. Each of these chapters is preceded by a brief introduction presenting the current state of knowledge on the research problem. The thesis concludes with a description of the performed experiments and calculations, and the summary and conclusions based on the performed studies.