The research proposed in the project are focused on the synthesis of novel multifunctional materials. The aim of our proposal "New MOF compounds as degradable nanocontainers for tyrosine kinase inhibitors in modern anti-cancer therapy" is the synthesis of a new type of MOF structures, based on multi-functional and biofriendly ligands, which will enable the construction of pioneering anticancer drug delivery systems.

The discovery of porous hybrid materials consisted of inorganic nodes and organic multifunctional ligands has created a new group of inorganic-organic hybrids (Metal-Organic Framework, MOF), which became the worthy competitors to existing traditional porous materials such as zeolites and activated carbons. Metal-organic structures (MOF) are novel, ultraporous organic-inorganic crystalline materials with the maximum surface area and properties that can be decided by selecting appropriate precursors or by functionalization of the material already synthesized by standard organic chemistry techniques. The above properties have led to a series of studies on these materials applications in many important areas, including repositories and gas separators, catalysts, sensors, as well as drug carriers.

This project will focus on the use of the MOF for drug release. MOF are promising nanomaterials for modern therapies as their structure consists of fully natural compounds. It allows to assume that the structures as well as their degradation products will be fully biocompatible and non-toxic. Furthermore, the method of their synthesis will enable a precise control of the size and surface chemical properties, and thus the effective immobilization of the anti-cancer drug. Internalization of drug into MOF will change its pharmacokinetic properties and reduce side effects.

Organo-metallic structures are very popular, especially in the context of the design of anticancer drug delivery systems. According to the idea, the proposed project involves the synthesis of new "bio-friendly" nanocontainers. We will synthesize the MOF structures that are not described yet. They will be fully characterized in terms of physicochemical and cytotoxic properties. Selected structures, fully degradable and non-toxic, with the best structural parameters will be used to internalize new anti-cancer drug. Anticancer properties of the constructed nanocontainers will be tested *in vitro* and *in vivo* in rat models of liver cancer.

The motivation to undertake research on the issue outlined in the project has become primarily to expand the knowledge of the new MOF materials capable of transporting and releasing advanced cancer drugs. In addition, the proposed project is an innovative and interdisciplinary approach that fully falls within the scope of the new requirements of science, especially in the aspects of innovation, the ground-breaking research and development of new knowledge, as well as in terms of its practical application. The proposed project, using innovative concepts in the field of nanotechnology, includes research on obtaining and characterization of new drug delivery systems based on metal-organic structures (MOF). The results achieved during the project implementation will allow for wide use of nanomaterials for medical purposes. They will contribute to widen the opportunities for design and construction of effective drug (including anticancer drugs) delivery systems. The results of the proposed research will also contribute to the development of parenchymal organ-sparing surgery, which is an issue important to improve the quality of life of patients with cancer.

This project will allow the applicants to carry out a fully innovative, interdisciplinary and intersection research, complementing and broadening their experience in the synthesis and nanotechnology (Faculty of Chemistry), as well as in biomedicine (Faculty of Biology and Faculty of Medicine). Research and collaboration will be carried out in laboratories proud of their long history of cooperation, unique validation models, modern research infrastructure, all in the accordance with the contemporary knowledge.