

Over the last fifteen years, there has been a growing interest in the synthesis and use of psychoactive and addictive substances. In the group of commonly known drugs, a new group of psychoactive substances has emerged, the so-called "Legal highs", the synthesis of which and general easy accessibility until recently were not regulated by law. The amount of new psychoactive substances caused an avalanche increase in acute poisonings with "new psychoactive substances", which often result in death.

Currently, medical treatment of people who show strong poisoning with psychoactive substances is conservative and symptomatic, consisting first in gaining control over the patient and then administering drugs that reduce the effects of drugs and sedate the patient.

The main goal of the project is to develop methods for the preparation of metal-organic frameworks (MOFs), which could be used as effective adsorbents of illegal psychoactive substances and as carriers of drugs reducing the impact of drugs on the central nervous system. Due to the fact that metal-organic frameworks have been developed relatively recently, it is necessary to optimize the synthesis methods in order to obtain structures with the desired sorption properties, low cytotoxicity and the possibility of controlled drug administration from the MOF structure. Through a wide selection of synthesis and modification parameters, it is possible to obtain precisely defined structure with specific properties.

The methods of synthesis and optimization of MOF materials developed as part of the project will allow to obtain effective sorbents with a MOF structure for removing drugs from the body in the detoxification process. Cytotoxicity and toxicity tests of the prepared MOF materials and their composites with drugs used in the treatment of severe drug poisoning will be conducted both on cells (in vitro) and in tests on living organisms (in vivo). The final stage of the work will be research on drug withdrawal symptoms in mice.

In the course of the research, modern methods of material characterization and advanced computational DFT methods will be used, which, along with the results of in vitro and in vivo tests, will allow to determine the mechanisms of drug sorption by MOF materials and methods of their effective optimization in order to obtain the desired structural parameters.

The developed mechanisms of drug sorption on MOF materials and the controlled release of drugs from their structure will contribute to the further development of modern materials for the treatment of severe drug poisoning.