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Mechanochemical Synthesis as a Proecological Approach of Production of MOF-type materials

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Population expansion, economic development and climate change have led to an increase in the amount of waste generated, as well as the amount of chemical compounds produced and released into the environment. Therefore, environmental protection and new ecological technologies are frequently discussed topics in the scientific community. Hence, in recent years, there has been an increase interest in searching for an alternative and environmentally friendly methods used for production of specific materials, among which, metal-organic framework compounds (MOFs), characterized with a wide range of applications, can be mentioned. Their porous structure makes them excellent candidates for selective adsorption and separation of gases from a mixture which is crucial in practical applications [1]. They are also ideal host platforms for the immobilization or encapsulation of other functional materials, such as nanoparticles (NPs), quantum dots, polyoxometalates, enzymes and polymers [2-5]. Some of MOFs themselves can also play the role of catalysts [6].

Unfortunately, the synthesis of materials with a metal-organic structure is usually complex, multi-stage and requires large amounts of solvents, often harmful to health and the environment. The above forces scientists to look for new synthesis protocols that will be simpler as well equally effective. Among many different synthesis approaches mechanochemical synthesis can be mentioned, which, due to its simplicity, is increasingly used in inorganic, organic and organometallic chemistry. This type of synthesis uses mechanical energy and significantly reduces the consumption of reagents, especially solvents, which makes it extremely interesting and less environmentally harmful. Presented work describes the synthesis of metal-organic materials applying mechanochemical approach, and its positive effects on materials physicochemical parameters as confirmed by the results of XRD, SEM/EDS and BET analyses.

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