Zr-BASED METAL-ORGANIC FRAMEWORKS: FROM SYNTHESIS TO APPLICATION

Roxana Nicola[1*], Carmen Cretu[1], Adel Len[2,3], Levente Illés[4], Zsolt Endre Horváth[4], Ana-Maria Putz[1]

[1]"Coriolan Drăgulescu" Institute of Chemistry, Bv. Mihai Viteazu, No. 24, 300223 Timisoara, Romania
[2]Institute for Energy Security and Environmental Safety, Centre for Energy Research, Konkoly-Thege Miklós út 29-33, 1121 Budapest, Hungary
[3]Faculty of Engineering and Information Technology, University of Pécs, Boszorkány street 2, 7624 Pécs, Hungary
[4]Institute for Technical Physics and Material Science, Centre for Energy Research, Konkoly-Thege út 29-33, 1121 Budapest, Hungary
email: cc.roxana@yahoo.com

Abstract

Metal-organic frameworks (MOFs) are a new class of crystalline micro/mesoporous hybrid materials, constructed by organic linkers and metal nodes, with significant application potential. Due to their chemical and physical properties, such as high surface area, large porosity, tunable pore size, and flexible functionality, MOFs have gained extensive explorations as a highly versatile platform for functional applications in many research fields [1,2]. Zr based metal-organic framework materials (Zr-MOFs) with increased specific surface area and pore volume have been obtained using the chemical and the solvothermal synthesis methods. The obtained materials were investigated by FT-IR spectroscopy, TGA, SANS, PXRD and SEM methods. The nitrogen porosimetry data evidenced the presence of pores with average dimension of ~4 nm and by SANS the average sizes of the Zr-MOF nanocrystals are suggested to be around 30 nm. The PXRD obtained patterns were characterized by similar features that point to well-crystallized phases specific for the UIO-66 type materials revealing by SEM also that the materials are composed of small and agglomerate crystals. The thermogravimetric analysis reveals that both materials have approximatively two linkers deficiencies per Zr_6 formula unit [3].

[1]. S. Soni, P.K. Bajpai, C. Arora, A review on Metal-Organic Framework: synthesis, properties and application, Charact. Appl. Nanomater. (**2019**) 2.
[2]. B. Maranescu, A. Visa, Applications of Metal-Organic Frameworks as Drug delivery Systems, Int. J. Molec. Sci. 23 (**2022**) 4458.
[3]. C. Cretu, R. Nicola, S.-A. Marinescu, E.-M. Piciorus, M. Suba, C. Duda-Seiman, A. Len, L. Illés, Z.E. Horváth, A.-M. Putz, Performance of Zr-based Metal-Organic Framework Materials as in Vitro Systems for the Oral Delivery of Captopril and Ibuprofen, Int. J. Mol. Sci. 24 (**2023**) 13887.

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