9th International Conference

WATER FOR ALL

19-20 May 2022 Osijek - Croatia

Book of Abstracts

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POTENCIJALNA PRIMJENA AKTIVIRANOG MOF-5 U RAZGRADNJI ORGANSKIH ZAGAĐIVAČA IZ OTPADNIH VODA

Ivan Ćorić, Jelena Kojčinović, Elvira Kovač-Andrić*

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Metaloorganske mreže (MOF) porozni su materijali s velikom sposobnosti adsorpcije. Upotrebom različitih liganada i kationa te promjenom uvjeta sinteze MOF-a moguće je dobiti široki spektar poroznih spojeva s različitim veličinama pora. Brojne prednosti nad zeolitima sličnim poroznim materijalima potaknule su istraživanja u svrhu uklanjanja polutanata pomoću MOF-a. Među najviše korištenim metodama sinteze MOF-a ističe se mehanokemijska sinteza, zbog uštede energije i smanjene upotrebe otapala. MOF se može koristiti kao senzor za polutante te za njihovu adsorpciju i degradaciju. MOF učinkovito adsorbira organske boje, pesticide i slične polutante iz vode ukoliko veličina pora odgovara veličini molekula polutanata i ukoliko postoje interakcije između te dvije molekule. U ovome istraživanju provedena je optimizacija mehanokemijske sinteze MOF-5 koji se sastoji od klastera Zn_4O i 1,4-benzendikarboksilata kao povezivača. Sinteza je provedena pri različitim uvjetima s obzirom na brzinu i vrijeme. Dobiveni su spojevi okarakterizirani infracrvenom spektroskopijom (FTIR) te uspoređeni sa spojem sintetiziranim klasičnom metodom gdje je korišten *N,N*-dimetilformamid (DMF) kao otapalo. Spoj MOF-5 dobiven klasičnom sintezom okarakteriziran je također rentgenskom difrakcijom na prahu (PXRD) te termogravimetrijskom analizom (TGA). Glavni problem koji se javlja prilikom sinteze MOF-5 je uklanjanje molekula DMF-a iz pora te aktivacija dobivene mreže. Kako mehanokemijska metoda ne zahtijeva uporabu otapala, molekule otapala nisu zaostale u porama zbog čega su dobivene metaloorganske mreže aktivirane i pogodne za adsorpciju zagađivača, te njihovu razgradnju.

Ključne riječi: metaloorganske mreže, mehanokemijska sinteza, polutanti

POTENTIAL APPLICATION OF ACTIVATED MOF-5 IN DECOMPOSITION OF ORGANIC POLLUTANTS FROM WASTEWATER

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Metal-organic frameworks (MOFs) are porous materials that exhibit large adsorption ability. By using different ligands and metal cations and by varying synthesis parameters, it is possible to obtain a large spectrum of porous materials with different pore sizes. Numerous advantages of MOFs compared to zeolites have encouraged the development of a research area that deals with the removal of pollutants. Among widely used synthesis methods, mechanochemical synthesis stands out due to energy saving and reduced usage of solvents. MOFs can be used as sensors for pollutants and their adsorption and degradation. MOF molecules adsorb organic dyes, pesticides, and similar pollutants effectively if the pore size corresponds to the size of the pollutant molecule and if there are existing interactions between these two molecules. In this research mechanochemical synthesis optimization of MOF-5 compound that consists of Zn_4O clusters and 1,4-benzenedicarboxylate as linker was conducted. Synthesis was carried out under different conditions in terms of synthesis rate and time. Obtained compounds were characterized by infrared spectroscopy (FTIR) and compared to MOF-5 compound obtained by the classical synthesis method where *N,N*-dimethylformamide (DMF) was used as a solvent. MOF-5 compound obtained by classical synthesis method was also further characterized by powder X-ray diffraction (XRD) and thermogravimetric analysis. The main problem in classical synthesis is the removal of solvent molecules from the pores of MOF-5 and activation of the obtained framework. Since mechanochemical synthesis does not require solvent, there are no solvent molecules in the pores of MOFs which makes them activated and suitable for adsorption and degradation of pollutants.

Keywords: metal-organic frameworks, mechanochemical synthesis, pollutants

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