

Tuning the performance of a novel functionality Zn-based MOF by incorporating a secondary linker in heavy metal ions absorption

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The rapid agricultural and industrial development is producing pollution of heavy metal ions because of their toxicity for humans and detrimental effects on the environment and ecology [1]. Accordingly, removing heavy metal ions from water is a particularly significant issue before they are released into the environment. In recent years Metal-Organic Frameworks have been regarded as remarkable candidates for the adsorptive removal of heavy metal ions because of their amazing attributes such as high surface areas, and designable chemical functionalization of pore surfaces [2]. In this work, a mixed-linker MOF strategy was chosen to show proof of this concept in accessing more active sites and preparing some defects in MOF structures to improve the adsorption efficiency of MOF-5 for heavy metal ion removal from water. A novel nitro functionalized pyrazole dicarboxylic linker (4-nitro-3,5-pyrazoledicarboxylic acid, PZDC-NO₂) as a second ligand and benzene-1,4-dicarboxylate (H₂BDC) was added to form a new mixed-ligand MOF material (MOF-5 (PZDC-NO₂)), under facile solvothermal synthesis, which was characterized by SEM, EDX, XRD, BET, and FTIR [3]. The new porous MOF was tested for the adsorption of heavy metal ions and showed an improved adsorption capacity compared to MOF-5 and many other standard adsorbents.

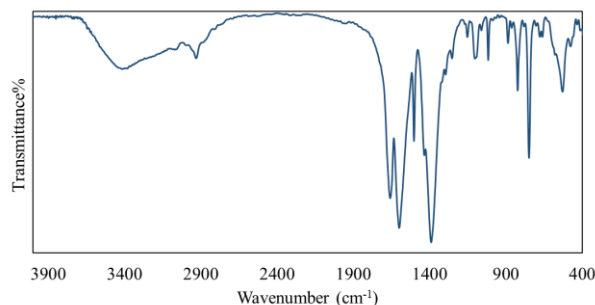


Figure 1. The FTIR spectrum of MOF-5 (PZDC-NO₂)

Keywords: Metal-organic framework, Metal ions absorption, Mixed linker.

References

- [1] M. Devaraj, Y. Sasikumar, S. Rajendran, L. C. Ponce, *Journal of The Electrochemical Society*, **2021**, 168, 037513.
- [2] Z. Latrach, E. Moumen, S. Kounbach, S. El Hankari, *American Chemical Society*, **2022**, 7 (18), 15862–15869.
- [3] W. Kleist, M. Maciejewski, A. Baiker, *Thermochimica Acta*, **2010**, 499 (1-2), 71-78.