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Zinc/Cobalt-based metal-organic framework (Zn/Co-MOF) composite as superhydrophobic and superoleophilic material for potential oil-water separation application

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Recently, porous crystalline materials consisting of organic ligands and metal ions, called metal-organic frameworks (MOFs), have been attended by a wide range of researchers and industries. These nanostructures have attracted a lot of interest in a wide range of applications, due to their superior unique structural features including high porosity, tunable pore size, specific surface area, and versatile performance [1], [2]. Zeolitic imidazolate frameworks (ZIFs) are a category of MOFs with the same structures as zeolites. They have been built upon 4-connected nets of tetrahedral units, wherein metal ions, such as Zn^{2+} or Co^{2+}, are linked through N atoms in diatopic imidazolate anions. In this study, the Zn/Co-MOF nanocomposite was synthesized and applied to the polyurethane (PU) foam for potential oil-water separation application. Crystalline and structural characteristics of the synthesized nanocomposite were evaluated by X-ray diffraction (XRD) and fourier transform infrared spectroscopy (FTIR). The obtained results show that nanocomposite has been well synthesized. The morphology of the fabricated nanocomposite was studied by field-emission scanning electron microscopy (FESEM). According to the obtained results, ZIF-8 nanocrystals with an average particle size of about 100 nm have well covered the surface of ZIF-67 rods. The elemental composition of the synthesized product by EDS analysis exhibits the presence of Co, N, Zn, O, and C atoms, confirming the successful synthesis of Zn/Co-MOF nanocomposite. The MOF/PU foam exhibits superoleophilic and superhydrophobic properties. The water and oil contact angle were measured and found to be 119° and 0°, respectively. Moreover, the MOF/PU foam showed the capacity to absorb oil or organic solvents in about 20 times its weight.

Keywords: Metal-organic frameworks, superhydrophobic, superoleophilic

References

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