

Facile synthesis of muscovite-supported metal-organic framework (MUS@MOF) composite for potential antibacterial activity

Sana Rostami, Mohammad Javad Abghary, Milad Atighi and Mahdi Hasanzadeh*

Department of Textile Engineering, Yazd University, Yazd, P.O. Box 89195-741, Iran

* E-mail: M.hasanzadeh@yazd.ac.ir

Uncontrollable bleeding has been considered one of the leading causes of death around the world. Thus, the development of new wound dressing materials with enhanced hemostatic properties is quite necessary. Meanwhile, bacterial infection is a crucial issue that can impair wound healing, as the blood clot can become a hotbed of bacterial growth and cause wound inflammation. So, today researchers focus on new materials and composites that enhanced the antibacterial properties of wound dressing. Metal-organic frameworks (MOFs), as relatively emerging crystalline nanoporous materials, have been gaining many interests thanks to their large specific surface area, high porosity, adjustable pore size, versatile functionality, and enriched host-guest chemistry. Among the MOFs, Cu-based MOF with antibacterial properties has been developed, recently [1]. On the other hand, Muscovite (also known as common mica, isinglass, or potash mica) is a hydrated phyllosilicate mineral of aluminum and potassium. According to the good properties of Muscovite and MOFs, we intend to synthesize and characterize this composite for potential application in wound dressing. Crystalline structure, chemical structure and bounds, morphological, and elemental analysis of MUS@MOF nanocomposite were carried out by X-Ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), field-emission scanning electron microscopy (FE-SEM) and Energy Dispersive X-ray Spectroscopy (EDS), respectively. The analysis of the XRD and FTIR results confirmed the successful synthesis of MUS@MOF nanocomposite. The FTIR revealed that the MOF interacted with the muscovite surface. The EDS analysis also exhibited the presence of Cu, Si, Al, O, and C atoms, confirming the successful synthesis of MUS@MOF nanocomposite. FE-SEM images showed that MOFs with nanometer particle size (minimum 18.38 nm, maximum 39.63 nm) have been well synthesized on two-dimensional (2D) muscovite sheets.

Keywords: Metal-organic framework, muscovite, antibacterial.

References

- [1] E. Lamei and M. Hasanzadeh, *Int. J. Biol. Macromol.*, **2022**, 208, 409–420.