22nd Iranian Chemistry Conference, 23-25 August, 2023
University of Kurdistan

Porphyrin Molecules Decorated on Metal-Organic Frameworks for Multi-Functional Biomedical applications.

Soheil Sojdeh,[a] and Mojtaba Bagherzadeh [a] *

[a]*Department of Inorganic chemistry, Faculty of Chemistry, Sharif University of Technology, Tehran, Iran*

[*] *E-mail: m.bagherzadeh.sharif@gmail.com*

Metal–organic frameworks (MOFs) have been widely used as porous nanomaterials for different applications ranging from industrial to biomedicals ([1]). An unpredictable one-pot method is introduced to synthesize NH_2-MIL-53 assisted by high-gravity in a greener media for the first time. Then, porphyrins were deployed to adorn the surface of MOF to increase the sensitivity of the prepared nanocomposite to the genetic materials and in-situ cellular protein structures. The hydrogen bond formation between genetic domains and the porphyrin' nitrogen as well as the surface hydroxyl groups is equally probable and could be considered a milestone in chemical physics and physical chemistry for biomedical applications ([2]). In this context, the role of incorporating different forms of porphyrins, their relationship with the final surface morphology, and their drug/gene loading efficiency were investigated to provide a predictable pattern in regard to the previous works. The conceptual phenomenon was optimized to increase the interactions between the biomolecules and the substrate by reaching the limit of detection to 10 pM for the Anti-cas9 protein, 20 pM for the single-stranded DNA (ssDNA), below 10 pM for the single guide RNA (sgRNA) and also around 10 nM for recombinant SARS-CoV-2 spike antigen. Also, the MTT assay showed acceptable relative cell viability of more than 85% in most cases, even by increasing the dose of the prepared nanostructures ([3]).

Keywords: gene delivery, CRISPR, biosensor, biomedicine, MOF, COVID-19

References

[1] P. Mokherjee, A. Kumar, K. Bhamidipati, *ACS Applied Bio Materials*, **2020**, 3, 869.
[2] P. Zhu, S. Li, C. Zhao, *Hzardous materials*, **2020**, 384,121426.
[3] N. Rabiee, S, Ahmadvand, Y. Fatahi, *Drug delivery science and technology*, **2020**, 59, 101879