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ABSTRACT VOLUME

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Efficient enzyme@MOF composites for biocatalysis

Marija Stanišić[1]; Predrag Ristić[1]; Ana Marija Balaž[2]; Milan Senćanski[3]; Dragana Mitić[4]; Radivoje Prodanović[1]; Tamara Todorović[1]

[1]University of Belgrade – Faculty of Chemistry
[2]Institute of Chemistry, Technology and Metallurgy, National Institute of the Republic of Serbia, University of Belgrade
[3]Vinča Institute of Nuclear Sciences, National Institute of the Republic of Serbia, University of Belgrade
[4]Innovation Centre of Faculty of Chemistry, University of Belgrade

Novel industrial biocatalysts are needed which can offer advantages over traditional chemical processes with respect to sustainability, process efficiency, and reduced negative impact on the environment. Implementation of either native or mutated enzymes for various industrial applications is currently limited due to a lack of protein stability in harsh conditions. Metal-organic frameworks (MOFs), known for their ultra-high porosity and crystallinity, are perfect host materials that can protect guest enzymes from inhospitable external environments. Herein we show that the surface charge and chemistry of a protein determine its ability to seed MOF growth. We demonstrate that chemical modification of carbohydrate parts on the protein surface is an effective method for controlling biomimetic mineralization by zeolitic imidazolate framework-8 (ZIF-8). Protein charge, mixing of reactants, and stirring speed have been demonstrated to play important roles in controlling biomineralization reaction rate, particle shape, and morphology. This study highlights the important role played by protein surface chemistry in encapsulation and outlines a general method for facilitating the biomimetic mineralization of glycoproteins.

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