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Molecular Interaction between Three-Dimensional Graphene Aerogel and Enzyme Solution: Effect on Enzyme Structure and Function

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Abstract

New membrane materials and processes have been extensively developed due to urgent needs for much more economic separation processes. Recently, graphene has been confirmed to be an excellent separation membrane. As there is no support in the obtained three-dimensional (3D) architecture constructed from tubular graphene network, it is possible to take full advantage of the large surface of graphene. In this study 3D graphene aerogels were synthesized by a simple method and modified to adjust hydrophilicity of the samples to achieve high liquid volumetric rate. Modified samples were used for the filtration of the enzymes including amylase, cellulose, lipase and protease. Slightly differently interactions between enzymes and samples causing different flow rates. To investigate changes in physicochemical properties of filtered enzyme, catalytic activity and structure of untreated and filtered samples were obtained using circular dichroism spectra and colorimetric assays. The configurations and functions of cellulose, lipase and protease were maintained during the processes. The results demonstrate that 3D graphene aerogels is a promising material for enzyme filtration and keep the aim of protein filtration which is providing high quality protein sample to achieve original information from interested protein species.

Keywords: Three-Dimensional Graphene Aerogel; Enzyme structure; Enzyme Function.

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