Toward controlled geometric structure and surface property heterogeneities of TiO2 for lipase immobilization

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Abstract

Immobilized enzymes as biocatalysts are expected to solve issues of pollution and economic inefficiency in industrial catalysis. In order to obtain an immobilized enzyme with high activity and stability, the design of substrate geometric structure and surface properties is desirable. Here, TiO2 with controlled pore size and surface properties was designed and synthesized for lipase immobilization, resulting in an efficient biocatalyst. The activity of TiO2 immobilized lipase is improved with the increasing pore size of TiO2 from 10 to 100 nm. Compared to geometric structure impact, regulation of surface properties plays a greater role on the immobilization of lipase on TiO2. Among them, the relative activity of ethenyl triethoxy silane (ETS) modified TiO2 immobilized lipase is as high as 365.85 % over the pristine lipase. This research provides experimental evidence for studying the adsorption of enzyme molecules on the supports under the synergistic effect of geometric structure and surface properties.

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