Designed Fabrication of Magnetically Switchable Bioelectrocatalytic System Using Enzyme-Loaded Magnetic Mesocellular Carbon Foam

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Nanostructured magnetic materials (NMMs) have attracted much attention due to their broad biotechnological applications including support matrix for enzyme immobilization, immunoassays, and biosensors. We developed a magnetically switchable biosensor by using magnetic mesocellular carbon foam with large interconnected mesopores. Mesocellular carbon foam, designated as Mag-MCF-C, was synthesized via new synthetic route based on mesocellular silica foam as a template, which enabled simultaneous synthesis of magnetic nanoparticles and mesocellular carbon, avoiding complicated multi-step procedures. Magnetic and physico-chemical characterization of Mag-MCF-C revealed that it possesses large interconnected pores and well-dispersed magnetic nanoparticles. Magnetically switchable glucose biosensor was constructed by immobilizing glucose oxidase (GOx) within the large cellular pores (diameter of 16.6 nm) of Mag-MCF-C. The enzyme loading reached ~ 53 % (w/w carbon), and Mag-MCF-C retained enzymes stably even under vigorous shaking. The biocatalytic oxidation of glucose on the gold electrode by Mag-MCF-C/GOx was electrochemically monitored and reversibly switched ON and OFF by controlling the electrical contact between

Mag-MCF-C/GOx and the electrode using external magnetic field. As a result, anodic currents were alternatively turned "ON" and "OFF" without loss of bio-electrocatalytic activity.

References

1. J. Lee *et al., Designed Fabrication of Magnetically Switchable Bioelectrocatalytic System Using Crosslinked Enzyme Aggregates Shipped in Magnetic Mesocellular Carbon Foam* (**2005**), *Angew. Chem. Int. Ed.*, Accepted.