

Characterization of Langmuir-Blodgett Films Incorporating Glucose Oxidase and Glucoamylase as Enzymes

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The nanolevel structure of Langmuir-Blodgett (LB) films incorporating enzymes was studied and elucidated. Enzyme LB films prepared by the Fromherz method were investigated by ultraviolet (UV) spectroscopy, X-ray photoelectron spectroscopy (XPS) and transmission electron microscopy (TEM), and the cross section and surface structures were shown. The sectional view was predicted and drawn. TEM observations through the use of plasma polymerization replication were effective for the surface of an LB film. Glucose oxidase was different from glucoamylase in the adsorption mode. Glucose oxidase molecules were aggregated in the LB layers whereas glucoamylase was dispersed. It was presumed that the activity loss of glucoamylase LB film, which caused the deterioration of a multistage bioreactor due to those enzymes, was caused by the action of amphiphilic molecules within the LB layers.

1. Introduction

The Langmuir-Blodgett (LB) technique for the preparation of organic ultrathin films is expected to be applied to many fields.⁽¹⁾ One of the applications is the preparation of biosensors incorporating enzymes. Langmuir-Blodgett (LB) films incorporating enzymes, made by way of the LB technique, are excellent in terms of the diffusion of substrate molecules.^(2,3) We expect that sequential enzymatic reactions proceed rapidly by combining LB films incorporating different enzymes, because it has been shown that a sequential