Abstract
The feasibility of using loofa sponge for immobilization of cellulase-producing microorganisms was investigated by acetylating loofa sponge. Acetylation was achieved by autoclaving process of loofa sponge immersed in acetic anhydride at various temperatures for various times. The degree of acetylation, as inferred by the weight percentage gain (WPG), was enhanced by increasing both temperature and the duration of acetylation. The acetylation of a piece of loofa sponge in an autoclave at 120 degrees C for 20 min resulted in a WPG of about 8%, which was sufficient to protect the loofa sponge against cellulose degradation. The acetylated loofa sponge prepared under this condition was not decomposed by commercial cellulase and its structure was maintained for more than 720 h during repeated-batch treatments with commercial cellulase. A flocculating yeast (Saccharomyces cerevisiae IR-2) and a fungus (Trichoderma reesei QM9414) were successfully immobilized in the acetylated loofa sponge. In each case, the percentage of immobilized cells was as high as that obtained using nonacetylated loofa sponge. Acetylation had no adverse effects on cell growth and immobilization of T. reesei QM9414, as well as on cell growth and ethanol production by S. cerevisiae IR-2. T. reesei QM9414 immobilized on an acetylated loofa sponge was successfully used for repeated-batch cellulase production from commercial cellulose powder. Although the acetylated loofa sponge showed a slight weight loss, it was not disintegrated by activated sludge. The results obtained in this study showed that acetylated loofa sponge is suitable as an immobilization carrier for bioprocesses involving cellulase.