

Study on the preparation of cellulose nanofibre (CNF) from kenaf bast fibre for enzyme immobilization application

ABSTRACT

This paper discussed on the preparation of natural CNF from kenaf bast fibre for the application as a support structure in enzyme immobilization. The treatments involved for this preparation were delignification, bleaching and high-intensity ultra-sonication process to obtain nanofibre with high cellulose content and less than 100 nm diameter. Chemical composition analysis showed the influence of each process treatment on cellulose content of raw bast fibre, bleached pulp fibre and CNF(63.67, 81.12 and 91.97%, respectively). By increasing the cellulose content and decreasing the size of cellulose fibre, it resulted in a greater number of –OH functional group on its surface that plays as important role in enzyme immobilization. FTIR spectroscopy confirms that the removal of lignin and hemicellulose from the fibre after the treatments, as well as its interaction with coupling agents and CGTase enzyme. About 62.10% of enzyme loading and 45.62% of its activity yield were obtained after immobilization. Enzymatic reaction of immobilized CGTase on CNF indicates about more than 60% relative production yield of α -CD was achieved and its reusability was able to retain about 67.0% from its initial activity after 8 cycles of reaction. Therefore, the CNF is a good potential as a support for enzyme immobilization.

Keyword: Cellulose nanofibre (CNF); Covalent immobilization; Cyclodextringluco-transferase (CGTase); Kenaf