

Development of cellulose nanofibre (CNF) derived from kenaf bast fibre and it's potential in enzyme immobilization support

ABSTRACT

This research mainly focuses on developing a natural cellulose nanofibre (CNF) from kenaf bast fibre and its potential for enzyme immobilization support. CNF was isolated by using a combination between chemical and mechanical treatments such as alkaline process and high-intensity ultrasonication process to increase the efficiency of hemicellulose and lignin removal, and to reduce its size into nano-order. The morphological study was carried out by using scanning electron microscope (SEM), indicating most of CNF diameter in range of 50-90 nm was obtained. The result of chemical analysis shows that cellulose content of raw bast fibre, bleached pulp fibre and CNF are 66.4 %, 83.7 % and 90.0 %, respectively. By decreasing the size of cellulose fibre, it increases the number of (OH) group on the surface that plays as important role in enzyme immobilization. Covalent immobilization of cyclodextrin glucanotransferase (CGTase) onto CNF support resulted in about 95.0 % of protein loading with 69.48 % of enzyme activity, indicating high immobilization yield of enzyme. The enzymatic reaction of immobilized CGTase was able to produce more than 40 % yield of α -CD. Reusability profile of immobilized CGTase resulted in more than 60 % of retained activity up to 7 cycles. Therefore, the CNF is highly potential to be applied as enzyme immobilization support.

Keyword: Cellulose nanofibre (CNF); Kenaf; Enzyme immobilization; Cyclodextrin glucanotransferase (CGTase); Chemical and mechanical treatments