

PLASTICIZED CORN HUSK CELLULOSE ESTER FILMS: THERMAL BEHAVIOR and MECHANICAL PERFORMANCE

Chadaporn Srimai¹, Usarat Ratanakamnuan^{2,*}

¹ Department of Chemistry, Faculty of Science, Maejo University,
Chiang Mai, 50290, Thailand

² Department of Innovation of Industrial Chemistry, Faculty of Science, Maejo University,
Chiang Mai, 50290, Thailand

**Corresponding Author Email: usarat@mju.ac.th*

Abstract

Corn husk-derived cellulose ester films were produced as sustainable polymer materials, and their mechanical and thermal characteristics were improved by including plasticizers. Cellulose was first extracted from corn husk using delignification, bleaching, and acid hydrolysis and then esterified with lauroyl chloride to yield cellulose laurate. The modified cellulose was then solvent cast into films, with glycerol, dibutyl phthalate (DBP), and triethyl citrate (TEC) added at amounts ranging from 1 to 10 wt%. The impact of plasticizers on the films' mechanical behavior and thermal stability was assessed. The degradation temperature (Td) of cellulose ester film was found to be 219°C, but the Td of plasticized cellulose ester film was significantly lower, indicating enhanced chain mobility and decreased intermolecular interactions. Mechanical testing found that increasing plasticizer content reduced tensile strength and Young's modulus while greatly improving film flexibility. Additionally, films with low glycerol concentrations (1-2 wt%) demonstrated improved elongation at break, indicating an acceptable balance between strength and ductility. These results indicate that plasticizer addition plays an important role in regulating the performance of cellulose ester films, paving the way for the production of flexible and sustainable biopolymer materials derived from agricultural waste.

Keyword: Corn husk, Cellulose, Cellulose Ester, Plasticizer, Thermal properties, Mechanical properties