

Isolation and characterization of nanocrystalline cellulose isolated from pineapple crown leaf fiber agricultural wastes using acid hydrolysis

ABSTRACT

Pineapple crown leaf fiber (PCLF) is one of the major biomass wastes from pineapple processing plants. It consists mostly of carbohydrate polymers, such as cellulose, hemicellulose, and lignin. It can be further processed to form a more valuable and widely used nanocrystalline cellulose (NCC). This study investigates the effect of hydrolysis time on the properties of the produced NCC. The acid hydrolysis was conducted using 1 M of sulfuric acid at hydrolysis times of 1–3 h. The resulting NCCs were then characterized by their morphology, functional groups, crystallinity, thermal stability, elemental composition, and production yield. The results show that the NCC products had a rod-like particle structure and possessed a strong cellulose crystalline structure typically found in agricultural fiber-based cellulose. The highest NCC yield was obtained at 79.37% for one hour of hydrolysis. This NCC also displayed a higher decomposition temperature of 176.9 C. The overall findings suggest that PCLF-derived NCC has attractive properties for a variety of applications.