

Title : Synthesis of Nanocellulose Fibers from Pineapple Peel and Effect of Fiber Content on Mechanical and Self-Healing Properties of Alginate/CMC Hydrogels

Author(s) : 1. Ployphat Panthong
2. Ruethairat Pongthawee

Student ID : 650510078

Student ID : 650510096

Major : Industrial Chemistry

Advisor(s) : 1. Assistant Professor Dr. Datchanee Pattavarakorn

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ABSTRACT

This research aimed to prepare self-healing hydrogels using biopolymers, specifically sodium alginate (SA) and carboxymethyl cellulose (CMC), as the matrix, with citric acid serving as a crosslinking agent. The influence of citric acid concentration on the various properties of the hydrogels was investigated. Additionally, cellulose nanofibers (CNFs) were synthesized from pineapple peels through a sequential process of alkaline treatment with sodium hydroxide, bleaching with hydrogen peroxide, and acid hydrolysis. The prepared CNFs were then incorporated into the SA/CMC hydrogels to evaluate the effect of nanofiber content on the self-healing performance. The results indicated that the hydrogel crosslinked with 7.81 M citric acid exhibited the most favorable properties, with a swelling ratio of 113.92%, water absorption of 440.54%, tensile strength of 0.15 MPa, and elongation at break of 137.60%. Furthermore, the CNF-reinforced hydrogels demonstrated self-healing capabilities, successfully rejoining within 24 hours after being severed. The study on self-healing efficiency revealed that the SA/CMC hydrogel containing 2% by weight of CNFs achieved the highest self-healing efficiency at 31.4%.

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