

SYNTHESIS OPTIMISATION AND FUNCTIONAL CHARACTERIZATION OF DODECENYL SUCCINIC ANHYDRIDE AND ACETIC ANHYDRIDE MODIFIED CORN STARCHES

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For the replacement of conventional plastics, the bioplastics based on renewable biopolymers such as natural polysaccharides are receiving increasing attention. In order to impart thermoplastic properties to polysaccharides such as starch dual chemical modification involving esterification reactions is an effective strategy to overcome the limitations of native starch.

In this study, corn starch was first modified with dodecanyl succinic anhydride (DDSA) at two substitution levels (degree of substitution of DDSA of 0.025 and 0.072), followed by acetylation reaction using acetic anhydride, which was optimized using central composite design. The optimized acetylation conditions yielded dual-modified starches with high degree of acetylation around 2.4. Structural characterization by FTIR confirmed the introduction of ester groups, while XRD analysis indicated a partial shift toward amorphous structure correlated with the degree of acetylation. Scanning electron microscopy analysis revealed that DDSA modification helped to retain the starch granule morphology during acetylation, conferring structural resilience. Thermal analyses showed that double-modified starches exhibited improved thermal stability compared to native and succinylated starches, and DSC revealed that glass transition temperatures were dependent on both DDSA and acetyl group substitution. These findings demonstrate that dual dodecanyl succinic anhydride–acetic anhydride modification allows tuning of thermal and structural properties, offering potential for tailored thermoplastic applications such as biodegradable packaging materials.

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