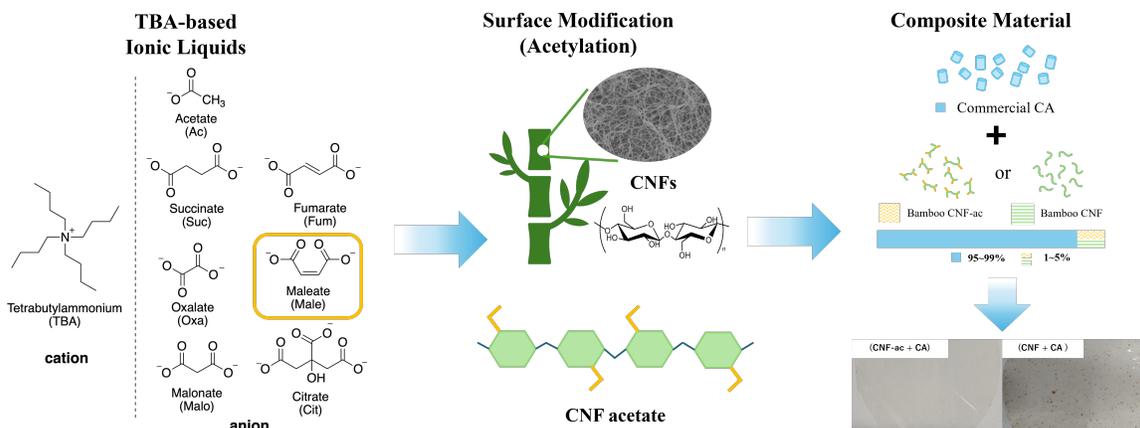


Tetrabutylammonium-based Ionic Liquid Screening Strategy for Minimal Crystallinity Disruption: Surface-Acetylated Bamboo CNFs as Reinforcer in Cellulose Acetate

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Conventional ionic liquids (ILs) used for cellulose modification, despite their high cellulose solubility, often induce the transformation of robust cellulose I crystalline structures to the weaker type II crystalline, compromising material strength.^{1,2} To address this challenge, this study developed six kinds of tetrabutylammonium (TBA)-based ionic liquid along with TBA-acetate for surface modification of cellulose while preserving its native crystalline structure. Regenerated bamboo cellulose nanofibers (CNFs) treated with these ILs were analyzed using XRD and SEM, revealing that TBA maleate minimally affected crystallinity and retained the cellulose I structure. Subsequently, TBA maleate was employed as a solvent medium for surface modification (acetylation) of CNFs, achieving a degree of substitution (DS) of 0.5. The modified CNF acetate were blended with commercial cellulose acetate (CA) at 1, 3, and 5 wt% ratios to evaluate their reinforcing effects. Results demonstrated that cellulose I crystalline-rich CNF acetate exhibited superior dispersion within the CA matrix, significantly enhancing mechanical properties. This work highlights the potential of crystalline-structure-preserving ILs for designing high-performance cellulose-based composite materials.



References

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