Ethoxylated and quaternized hydroxyethylcellulose: A sustainable approach to derivatization paired with film formation.

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Despite the wide availability of cellulose and its considerable attributes, its derivative quaternized ethoxylated hydroxyethyl cellulose (CELqh) has hardly been used in film productionIn this study, hydrophilic and transparent films were produced from CELqh aqueous solutions, different concentrations of CELqh were considered, as well as the use of glycerol as a plasticizer. Zinc oxide nanoparticles (ZnO NPs, 19.7 ± 1.4 nm) were synthesized and incorporated into films to confer them antimicrobial properties. To decrease hydrophilicity and evaluate changes in other properties, the hydroxyl groups of this macromolecule were utilized as polyols in the synthesis of bio-based polyurethanes, resulting in concomitant film formation (PUCELqh). Castor oil, which primarily comprises ricinoleic acid triglyceride, was used to disperse the reagents and as an additional source of hydroxyl groups. ZnO NPs and glycerol were also included in these films. The iCELqh exhibited thermal stability up to approximately 200 °C. The electrical conductivity of the films containing glycerol and ZnO decreased compared to the control (CELqh), indicating that the additives interfered with the transport of electrical charges. Typically, a CELqh-type film exhibits tensile strength, Young's modulus, and elongation at break of approximately 13 MPa, 23 MPa, and 47%, respectively. The PUCELqh-type films demonstrate hydrophobicity and thermal stability up to around 300 °C, with tensile strength, Young's modulus, and elongation at break of approximately 3 MPa, 5 MPa, and 75%, respectively. The tensile properties of both types of films varied to higher or lower values depending on the additive present. The ongoing study aims to develop films with potential applications in sensors, antiviral food packaging, and dressings, among other areas.

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