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Correlation of chitosan's rheological properties to its ability to electrospin WENDY E. KRAUSE, HAILEY A. QUEEN, REBECCA R. KLOSSNER, ANDREW J. COUGHLIN, North Carolina State University — Chitosan, derived from chitin found in the exoskeleton of crustaceans, has been investigated extensively for use in biomedical applications ranging from drug delivery to scaffolds for tissue engineering. Therefore, forming nanofibers of this linear polysaccharide is desirable for use in such applications, because the nanofibers can be tailored to mimic the size and porosity of the extracellular matrix. Electrostatic spinning (electrospinning) is a convenient method to produce nonwoven mats of nanofibers. The ability of the solutions to successfully electospin is closely correlated with the rheological properties of the solutions. Chitosan is challenging to electrospin due to its relatively high viscosity at modest concentrations. Solutions of chitosan blended with poly(ethylene oxide) (PEO) have been electrospun successfully with freshly prepared solutions. If the blended solutions are stored, they do not readily electrospin. Moreover, chitosan/PEO blend solutions show a drastic decrease in zero shear rate viscosity over time, which can be attributed to phase separation. The challenges associated with electrospinning charged biopolymers (chitosan is cationic) will be discussed in terms of their rheological properties. Successes and failures will be highlighted and compared results for readily electrospun neutral polymers.

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