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Nanocellulose Composite Materials Synthesizes with Ultrasonic Agitation TIMOTHY KIDD, ANDREW FOLKEN, BYRON FRITCH, DEREK BRADLEY, University of Northern Iowa — We have extended current techniques in forming nanocellulose composite solids, suspensions and aerogels to enhance the breakdown of cellulose into its molecular components. Using only mechanical processing which includes ball milling, using a simple mortar and pestle, and ultrasonic agitation, we are able to create very low concentration uniform nanocellulose suspensions in water, as well as incorporate other materials such as graphite, carbon nanotubes, and magnetic materials. Of interest is that no chemical processing is necessary, nor is the use of nanoparticles, necessary for composite formation. Using both graphite and carbon nanotubes, we are able to achieve conducting nanocellulose solids and aerogels. Standard magnetic powder can also be incorporated to create magnetic solids. The technique also allows for the creation of an extremely fine nanocellulose suspension in water. Using extremely low concentrations, less than 1% cellulose by mass, along with careful control over processing parameters, we are able to achieve highly dilute, yet homogenous nanocellulose suspensions. When air dried, these suspensions have similar hardness and strength properties to those created with more typical starting cellulose concentrations (2-10%). However, when freeze-dried, these dilute suspensions form aerogels with a new morphology with much higher surface area than those with higher starting concentrations. We are currently examining the effect of this higher surface area on the properties of nanocellulose aerogel composites and how it influences the impact of incorporating nanocellulose into other polymer materials.

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