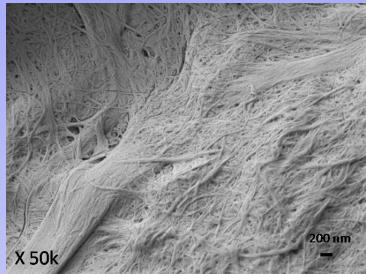


The Use of Cellulose Nanofibers to Reinforce Latex Films and Coatings

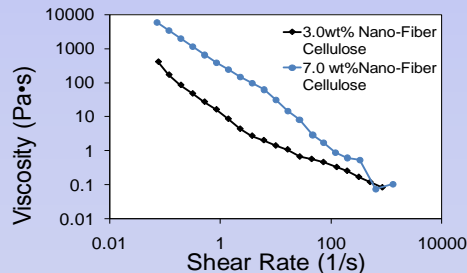
Gerard Gagnon, Rikard Rigdal, Hitomi Hamada, Michael Bilodeau, and Doug Bousfield
 Department of Chemical and Biological Engineering and Process Development Center,
 University of Maine, Orono, ME 04469

Nano-Fiber Cellulose Production:

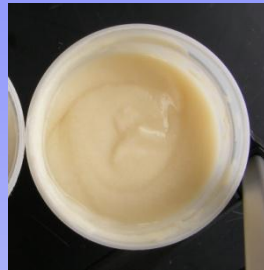
A chemical pre-treatment was performed on hardwood kraft pulp. Suspensions of cellulose pulp in water were prepared and mechanical treatment was applied. For the final step, suspensions were flowed through a 125 μm orifice up to five times.



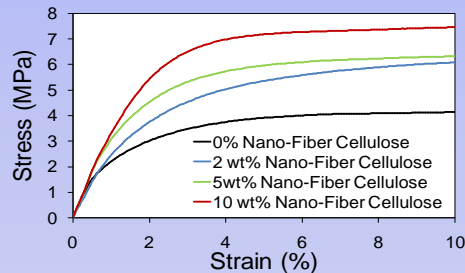
FE SEM image of dried nano-fiber cellulose on a non-woven substrate.



Suspension viscosity at various steady shear rates.



Cellulose suspension, 4.6 wt%, before homogenizer processing.



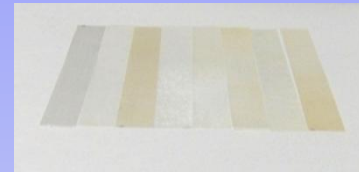
Tensile stress of SBR latex films containing various amounts of nano-fiber cellulose (8 hr pre-treatment).

Conclusions:

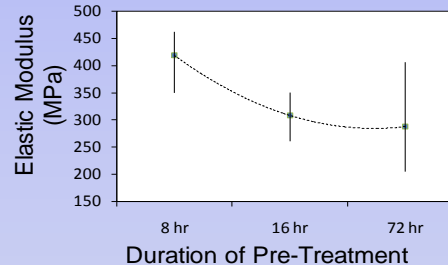
Nano-fiber cellulose can be produced by mechanical and homogenizer processing of chemically pre-treated pulp. Nano-fiber cellulose improved the elastic modulus and stress to rupture of SBR latex films. Films containing cellulose with longer pre-treatment durations had lower elastic modulus values.

Preparation of tensile testing samples:

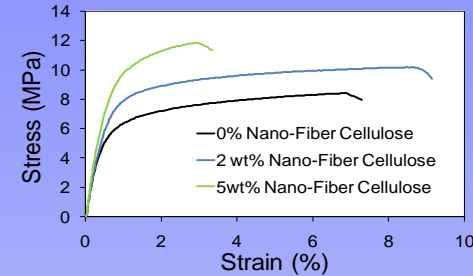
Film were prepared by drawing down suspensions consisting of nano-fiber cellulose and styrene butadiene rubber latex in a gap coater and drying with heat lamps. The application of fluid followed by drying was repeated multiple times until the desired thickness was reached. Multiple test strips were cut from each film sample.



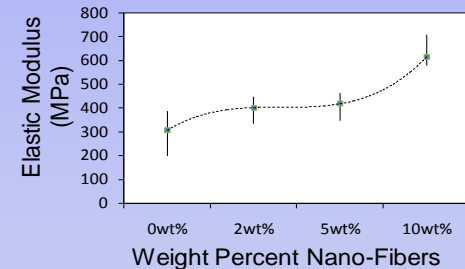
Tensile test strips, composed of SBR latex and nano-fiber cellulose.



Elastic modulus of SBR latex films containing 5 wt% nano-fiber cellulose with different pre-treatment durations.



Tensile stress of SBR latex/kaolin pigment (1:1) films containing various amounts of nano-fiber cellulose (8 hr pre-treatment).



Elastic modulus of SBR latex films containing various amounts of nano-fiber cellulose (8 hr pre-treatment).