

Roll-to-roll Coating of Cellulose Nanofiber Suspensions

Vinay Kumar*, Axel Elfving*, Douglas W. Bousfield** and **Martti Toivakka***

*Laboratory of Paper Coating and Converting, and Center for Functional Materials, Åbo Akademi University, Turku, Finland

**Department of Chemical and Biological Engineering, University of Maine, Orono, ME

Micro- and nanoscale cellulosic fiber materials have recently been intensively studied for potential uses in various applications. Examples range from use as rheology modifier, cell growth matrix or aero gel to transparent “nanopaper”, membrane filters and barrier coatings and films. The coating applications have been motivated by the high oxygen and grease barrier of the nanocellulosic films. However, most research so far has been limited to small, batch-produced samples. Reports on continuous processing into films or coatings, which is required for large-scale low cost production, are few. Similarly, high deformation rate rheology of nanocellulose, which is relevant for high speed coating operations, has not been reported. The current work measures high shear rate viscosity of cellulose nanofibers utilizing slot geometry and compares the results to those obtained with parallel plate and concentric cylinder devices. The high apparent shear-thinning behavior, which results in low effective process viscosity at high deformation rates, enables roll-to-roll coating of highly viscous, gel-like cellulose nanofiber suspension on paper.

*Corresponding author:

Prof. Martti Toivakka
Laboratory of Paper Coating and Converting
Center for Functional Materials
Åbo Akademi University
Porthansgatan 3
FI-20500 Åbo/Turku, Finland
Email : Martti.Toivakka@abo.fi
Tel : +358-2-2154852
URL : www.abo.fi/lpcc