Editorial

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A PaperCon preview of what's coming in April

Coming soon is PaperCon—TAPPI's annual technical conference for paper and packaging industry professionals. Held this April 26-29 in Atlanta, GA, the conference features sessions on management, coating and graphic arts, process control, recycled paperboard, and a wide range of papermaking topics. Universities and research organizations from around the world are represented in the conference content, and below is a preliminary sampling of just a few of the many presentations that might interest *TAPPI Journal* readers.

PaperCon: Coating & Graphic Arts Track

Colloidal interaction to generate novel coatings
—Pradnya Rao, University of Maine

Binders are the costliest components in paper coatings. Furthermore, the presence of nonuniform binder distribution resulting from binder migration in the coating layer can affect print quality. This research focuses on the formation of suspensions containing cationic pigments decorated with anionic binders.

Pigment cationic precipitated calcium carbonate (PCC) was coated with anionic styrene-butadiene (SB) latex composites in the solution phase, leading to a negatively charged pigment/binder particle. Coatings fabricated with these suspensions showed lower binder migration than coatings prepared with standard formulations. Migration of binder in coatings generated on three different substrates of glass, paper, and blotting paper were measured using Raman spectroscopy. In all cases, there was reduced binder migration in the decorated pigment suspension as compared with the control suspension. The coated papers were also measured for strength using the IGT pick test. A significant difference in the picking strength of the coating compared to coatings prepared with standard formulations was not found. This approach produced coatings equal in strength to conventional coatings, but with reduced binder migration due to strong electrostatic attraction between the cationic pigment and anionic binder.

Lignin-containing nanocellulose films and coatings for value-added and sustainable packaging applications
—Preeti Tyagi, North Carolina State University

Market forces have made substantial advances in packaging technology, leading to greater innovation to satisfy end-customer needs. The objective of this study was to develop lignin-containing cellulose nanofibrils (L-CNF) films and coatings to provide sustainable barrier packaging. This approach presents fundamental characterizations of various L-CNF with respect to their morphologies, crystallinities, compositional analyses, and charges. Further, the barrier properties of various L-CNF-coated linerboard and films were compared. The L-CNF used was produced using both an eco-friendly process and feedstock. The barrier properties were found to be dependent not only on the lignin content and lignin distribution, but also on the coating and film densities. These findings highlight lignin-containing CNF as a viable means to improve desired packaging properties.

PaperCon: Papermaking Additives Track

The effect of contact time between CPAM and colloidal silica on the flocculation behavior in the approach flow
—Paul Krochak, RISE–Research Institutes of Sweden

Multicomponent wet-end systems have become increasingly common in papermaking, with the objective of improving the retention-formation-dewatering relationship. It is quite common to use at least a cationic polymer, often in combination with an anionic microparticle. In some cases, a fixative is also used. However, there is still debate on the optimal implementation of these systems. In particular, optimizing the contact time of the cationic polymer prior to addition of the anionic microparticle is still poorly understood.

In this work, researchers investigated the effect of the contact time of a cationic, linear polymer (in this case cationic polyacrylamide), prior to addition of silica microparticle, on the flocculation response in a flowing fiber suspension. The effect of using a fixative was also investigated. Focused beam reflectance measurements were combined with z-potential measurements for optimizing the addition levels of a 2- and 3-component system, as well as for elucidating the effect of contact time on additives' performance. Trials were then performed on a pilot scale flow loop, where the time between addition of these two components was varied and the resulting flocculation response was characterized using high-speed filming and image analysis techniques. It was shown that the efficacy of CPAM can be improved significantly through use of a fixative and that shorter contact times result in an improved flocculation response in these systems.

PaperCon: Process Control Track

Measurement of S and Na distribution in impregnated wood chips by XRF
—Hafizur Rahman, Mid Sweden University

As there are increasing demands to replace plastics, especially as packaging materials, with renewable, easy-to-recycle, and compostable materials, there is also an increasing demand to improve the fundamental scientific understanding of pulp and paper manufacturing systems. High yield pulping processes, such as chemithermomechanical pulp (CTMP), are increasingly interesting for packaging material and hygiene paper. The yield from wood chips to final fiber is about 90%–98% and due to that, the lignin (28% of coniferous wood) plays a key role when designing properties of packing materials.

A key unit operation when producing CTMP is the pretreatment of wood chips before defibration. To separate the wood to individual fibers with minimum electricity, it is often necessary to soften the lignin. The lignin is softened by combining sulfonation at high pH and elevated temperatures in the preheater and in the refiner. As the size of wood chips is normally about 20 mm in length and 3–4 mm in thickness, with varying fiber size, it is challenging to create a process technology that gives an even distribution across the wood chips of the sodium-sulfite containing liquid used for impregnation. To improve the impregnation technology, it is valuable to measure the sulfonation degree on a detailed level. It should be possible to use this methodology in full-scale systems. The X-ray fluorescence (XRF) imaging system used, with collimated X-Ray source and spectroscopic detector, can make an image of sulfur and sodium across wood chips or in individual fibers.

PaperCon: Papermaking Fundamentals Track

Fundamental understanding of bound water removal in the paper drying process
—Cyrus Aidun, Georgia Institute of Technology

There is great interest in increasing the efficiency of paper forming machines in terms of water and energy use. Foam forming is a technology that can significantly decrease water usage and drying energy demands. Product properties such as formation and bulk are much improved, whereas strength levels normally decrease. To optimize strength properties, it is often desirable to improve in-plane fiber orientation isotropy.

Fiber orientation in water-formed paper is well understood. However, this is not the case in foam forming. Experimental and computational methods are being developed to gain insight in high-density foam rheology and flow interaction with suspended fibers. The experimental approach in this study is based on fiber orientation visualization using X-ray imaging. In parallel, a computational methodology is being developed to better understand the hydrodynamics of dense bubbly flow that is formed in the approach flow,

the headbox, and the forming jet. To this end, both high fidelity direct simulations and low fidelity model simulations are carried out. The aim of the former is to obtain a detailed structure of the complex flow field by resolving the air-water interface and to develop new low-fidelity models, whereas the latter aims at assessing and extending the predictability and validity of models to use in studying flow in the entire headbox and forming section.

Computer simulation of liquid wetting in low density fibrous networks
—D. Steven Keller, Miami University

Absorption characteristics, including the rate of wetting and volumetric holding capacity of aqueous solutions, are important quality metrics for retail and away-from-home paper towels. The spreading of liquid is a function of the surface energetics of the liquid-fiber system, as well as the heterogeneous distribution of fiber density within the structure. Kitchen towels incorporate structural features that significantly vary local web density and span dimensions from the fiber scale (10–6 m) to embossments and multi-plies (10–3 m).

Most standard absorption tests rely on the bulk absorption behavior of the products in an attempt to simulate end-use performance. Recent studies have explored the meso-scale wetting behavior, with interest in observing how structural features and liquid chemistry influence wetting. The modeling of liquid wetting must now focus on use of traditional wetting theory, such as that of Lucas-Washburn. **TJ**

If this selection of presentations from PaperCon is of interest to you, please register and join TAPPI and other industry professionals in Atlanta for these unique sessions.