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New lignocellulosics address consumer expectations and industry prosperity

Editor's Note: TAPPI would like to thank Arthur J. Ragauskas of the TAPPI Journal (TJ) Editorial Board, as well as Guest Editor Yunqiao Pu, for developing this special Lignocellulosics issue.

– Monica Shaw, Editorial Director

Awalk down a grocery store aisle is an amazing lesson in the creativity and productivity of the pulp and paper industry. There, you can realistically show students interested in a forest products career where we are in the production of lignocellulosic products and where we may well be headed. Many of the issues that have and will drive innovations are clearly illustrated in a grocery aisle, including:

- Recycling
- Sustainable/environmentally friendly production practices
- Convenient, high-performance products, including paper, packaging, filtration, towel, tissue, hygiene, and healthcare items
- Issues of physical strength properties, as well as barrier and optical properties

Yet even as we examine existing products, it is clear that today's consumers have expectations that significantly differ from former generations, and this provides new opportunities and challenges for the pulp and paper industry.

Lignocellulosics for new consumer patterns

With development of new materials and changes in consumer patterns, there is a constant challenge for chemical and mechanical pulps to address these demands and to evolve into improved/new physical



Polyurethane made from lignin.



Current studies by L. Liang and A.J. Ragauskas are directed at designing lightweight nanocellulosic foams.

attributes and properties. Certainly, this has been a growing theme in lignocellulosic research over the past few decades, and it seems to only have accelerated as illustrated in the patent realm, with a few examples exemplified below:

- Kuo, C.K. and Huang, C.H., "Paper box with wireless signal transmission component and manufacturing method thereof," *U.S. Pat. Appl.*, 2016, US 20160010285 A1 20160114.
- Lee, J.H. and Lee, H.J., "Nanocellulose from non-lignocellulosic biomass for use in moisturizers and superabsorbents," *Repub. Korean Kongkae Taebo Kongbo*, 2017, KR 2017011697 A 20170202.
- Lou, X., Feng, Z., and Feng, X., "Antibacterial paper for daily use and its making method," *Faming Zhuanli Shenqing*, 2017, CN 107524052 A 20171229.
- Hong, W., Zhou, J., Kanungo, M., et al., "Design of biomedical paper sensor," *U.S. Pat.*, 2016, US 20160051980 A1 20160225.
- Honnorat, A., "Paper that cannot be forged using solvents," *U.S. Pat. Appl.*, 2014, US 20140027078 A1 20140130.
- Hasani, M., Mesic, N., Soederqvist L.M., et al., "Cellulose nanocrystal-containing cellulosic product," *Eur. Pat. Appl.*, 2013, EP 2639351 A1 20130918.
- Samec, J., Enquist, K., and Cordova, A., "Method for improving properties of cellulose-based fibrous sheet-formed materials for use in medical goods," *Eur. Pat. Appl.*, 2011, EP 2309059 A1 20110413.

Coupled with this pathway of innovation is the question of how we can improve the production process and garner greater value from wood resources; hence, there is the ongoing focus on evolving a pulp mill to a biorefinery whereby waste streams in pulp production are fractionated and these process streams become a valuable bioresource for the production of new materials and chemicals [1]. This special issue of *TAPPI Journal* examines some of the challenges in lignocellulosics and helps illustrate the exciting new pathways available in research. **TJ**

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1. Chakar, F.S. and Ragauskas, A.J., "Review of current and future softwood kraft lignin process chemistry," *Ind. Crops Prod.* 20(2): 131(2004).