<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOMASS CONVERSION</td>
<td>159</td>
<td>Review of currently available technology for the conversion of woody biomass to value-added products</td>
</tr>
<tr>
<td>Authors</td>
<td></td>
<td>Benjamin A. Thorp, Harry Seamans, Harry Cullinan, and Masood Akhtar</td>
</tr>
<tr>
<td>NANOFLLE-PAPER</td>
<td>167</td>
<td>Facile preparation of nanofiller-paper using mixed office paper without deinking</td>
</tr>
<tr>
<td>Authors</td>
<td></td>
<td>Qiangqian Wang and J.Y. Zhu</td>
</tr>
<tr>
<td>PRETREATMENT</td>
<td>179</td>
<td>Flexible pretreatment technology supports production of biobased co-products at pulp and paper mills</td>
</tr>
<tr>
<td>Authors</td>
<td></td>
<td>Vesa Pylikkanen, Kim Neilsen, Mikhail Dakovicev, and Theodora Retsaia</td>
</tr>
<tr>
<td>BIOACTIVE COMPOUNDS</td>
<td>187</td>
<td>Biorefining to recover aromatic compounds with biological properties</td>
</tr>
<tr>
<td>Authors</td>
<td></td>
<td>Oana-Crina Bujor, Iulia Adina Talmaciuc, Irina Volf, and Valentin I. Popa</td>
</tr>
<tr>
<td>HYDROTHERMAL BIOREFINING</td>
<td>195</td>
<td>Hydrothermal refining of biomass — an overview and future perspectives</td>
</tr>
<tr>
<td>Authors</td>
<td></td>
<td>Hanne Wikberg, Vidar Grönberg, Johannes Jermakka, Katarina Kemppainen, Marjatta Kleen, Christiane Laine, Ville Paaskallio, and Anja Oasmaa</td>
</tr>
<tr>
<td>BIOREFINERY RESEARCH</td>
<td>209</td>
<td>Flippr® — an industrial research project in Austria</td>
</tr>
<tr>
<td>Authors</td>
<td></td>
<td>Melanie Mayr, René Eckhart, Ivan Sumersakyy, Antje Potthast, Thomas Rosenau, Josep-Peter Schögg, Alfred Posch, and Thomas Timmel</td>
</tr>
</tbody>
</table>

SPECIAL CENTENNIAL CONTENT // PAGE S1
UNPLANNED DOWNTIME MAY YIELD SIMILAR RESULTS.

Choose LOCTITE solutions for your toughest maintenance problems.
From threadlocking to surface wear solutions, Henkel’s LOCTITE Brand Products provide high-performance maintenance solutions that save time and reduce costs for your paper mill.

LOCTITE products can help:

- Increase equipment reliability
- Reduce energy costs
- Improve safety
- Reduce inventory costs
- Reduce fluid consumption
- Save time

Visit www.henkelna.com/pulpandpaper for more information or to schedule a LOCTITE Maintenance Workshop.

To speak with a LOCTITE Product Specialist in your area call 1.800.LOCTITE (562.8483) or 1.800.263.5043 (within Canada)

All marks used above are trademarks and/or registered trademarks of Henkel and its affiliates in the U.S., Germany and elsewhere.

© 2015 Henkel Corporation. All rights reserved. 12810 (2/15)
March 2015

**TABLE OF CONTENTS**

**EDITORIAL**
Forest biorefining fast forward
Arthur J. Ragauskas and Timothy G. Rials

**BIOMASS CONVERSION**
Review of currently available technology for the conversion of woody biomass to value-added products
Benjamin A. Thorp, Harry Seamans, Harry Cullinan, and Masood Akhtar

**NANOFILLER-PAPER**
Facile preparation of nanofiller-paper using mixed office paper without deinking
Qianqian Wang and J.Y. Zhu

**PRETREATMENT**
Flexible pretreatment technology supports production of biobased co-products at pulp and paper mills
Vesa Pylvänen, Kim Nelson, Mikhail Iakovlev, and Theodora Retsina

**Bioactive compounds**
Biorefining to recover aromatic compounds with biological properties
Oana-Crîna Bujor, Iuliu Adina Talmaciu, Irina Volf, and Valentin I. Popa

**HYDROTHERMAL BIOREFINING**
Hydrothermal refining of biomass — an overview and future perspectives
Hanne Wikberg, Vidar Grönberg, Johannes Jermakka, Katarina Kemppainen, Mariatta Kleen, Christiane Laine, Ville Paasikallio, and Anja Oasmaa

**BIOREFINERY RESEARCH**
Flippr® — an industrial research project in Austria
Melanie Mayr, Rene Eckhart, Ivan Sumerskiy, Antje Potthast, Thomas Rosenau, Josef-Peter Schögg, Alfred Posch, and Thomas Timmel

**SPECIAL 100TH ANNIVERSARY SECTION**

S1-S24 2015 TAPPI Centennial Celebration: Honoring Our Past, Inspiring Our Future

**ON THE COVER:** This issue of *TAPPI Journal* celebrates TAPPI’s Centennial with forward-looking content on industry opportunities in the field of biorefining, as well as content describing the role of TAPPI in its past.
Forward thinking is in our DNA

Valmet has a long history of innovation for the pulp, paper and energy industries. We have an impressive intellectual property portfolio of over 1,800 protected innovations. Extensive technological know-how and a broad process understanding enable us to continue to introduce new cutting edge concepts that move our customers’ performance forward.

Learn more at valmet.com
Forest biorefining fast forward

Editor's Note: Welcome to this special issue of TAPPI JOURNAL (TJ) organized for the 2015 TAPPI Centennial Celebration. The theme for this celebration, which will culminate at PaperCon 2015, April 19-22 in Atlanta, GA, USA (www.papercon.org), is “Honoring our past, Inspiring our Future.” As such, this issue features special content reflecting the role TJ has played in TAPPI’s history. It also contains special biorefinery content organized by Arthur J. Ragauskas of the TJ Editorial Board, and Timothy G. Rials, guest editor, that highlights the potential biorefining represents for the future of the forest products industry. TAPPI would like to thank Dr. Raugaskas and Dr. Rials for their work on this issue, as well as those who participated in the peer review process. Additional information on TAPPI’s Centennial Celebration can be found at www.tappi100years.org

– Monica Shaw, Editorial Director

A recent trip to Europe provides a convenient platform to summarize many research efforts in forest biorefining. A combination of researchers and entrepreneurs are investigating the use of cellulosics, hemicellulosics and lignin for new applications:

- Aviation biofuels
- Biobased plastics/nanocellulosic composites
- Hemicellulose resin/nanocellulosic reinforced materials
- Lignin carbon fibers components
- Cellulosic biofuels
- Lignin bio-batteries
- Lignin & biobitumen reinforced roads
- Biobased food packaging
- Lignin/nanocellulosic home insulation
- Cement and bricks reinforced with nano- and macro- cellulosics
- Biobased films and foams
- Cellulosic textile fibers
- Nanocellulosic reinforced paints, composite boards, tile and siding

Although many plant resources and partners will be needed for this vision, it is clear that the forest products industry will play a distinct role in these exciting developments. This is because the industry has a long, productive history in growing, collecting, fractionating, and sustainably processing lignocellulosics into value added chemicals, materials, and power. To address this opportunity, a host of companies, universities, and research institutions are building a new value chain of forest biorefining knowledge. TJ plays a special role in this field by bringing together researchers, academics, entrepreneurs, policy makers, and the established forest products industry, which understands the need to find new value-added product streams from the forest while leveraging its ongoing manufacturing base. As a forward-looking issue, this issue of TJ reflects the interests and the recent developments in forest biorefining from an international perspective. The search for new products from wood resources dovetails into recent developments in biomanufacturing that yield high performance products from sustainable bio-resources.

Of special interest are those institutions that can combine industry partners with academics and governmental partnerships to create novel translational research programs that will accelerate practical developments. The articles in this special issue of TJ document some of the exciting opportunities in biorefining that are leading to the new forest products industry. TJ

Arthur J. Ragauskas is professor and Governor’s Chair in Biorefining, Oak Ridge National Laboratory, Department of Chemical and Biomolecular Engineering, Department of Forestry, Wildlife, and Fisheries, at The University of Tennessee-Knoxville, Knoxville, TN, USA.

Timothy G. Rials is professor in the Department of Forestry, Wildlife, and Fisheries, and is director of the Center for Renewable Carbon at The University of Tennessee, Institute of Agriculture, Knoxville, TN, USA.
Nalco Innovation Delivers Value

Nalco, an Ecolab Company, is firmly committed to the pulp and paper industry. Nalco partners with pulp and paper producers worldwide to deliver economic and environmental value, through our reliable, cost-effective and safe solutions.