

NORDIC PULP & PAPER RESEARCH JOURNAL

THE INTERNATIONAL RESEARCH JOURNAL
ON SUSTAINABLE UTILIZATION OF FOREST BIORESOURCES

EDITOR-IN-CHIEF

Gunnar Henriksson, KTH Royal Institute of Technology, Stockholm, Sweden

EDITOR

Josefin Illergård, KTH Royal Institute of Technology, Stockholm, Sweden

EDITORIAL BOARD

Geoffrey Daniel, Swedish University of Agricultural Sciences, Uppsala, Sweden

Per Engstrand, Mid Sweden University, Sundsvall, Sweden

Merima Hasani, Chalmers University of Technology, Göteborg, Sweden

Christer Korin, Örebro University, Örebro, Sweden

Magnus Lestelius, Karlstad University, Karlstad, Sweden

Tom Lindström, KTH Royal Institute of Technology, Stockholm, Sweden

Carlos Martín Medina, Inland Norway University of Applied Sciences, Hamar, Norway

Kristiina Oksman, Luleå University of Technology, Luleå, Sweden

Monika Österberg, Aalto University, Espoo, Finland

Anna Sundberg, Åbo Akademi University, Turku/Åbo, Finland

Kristin Syverud, RISE-PFI and Norwegian University of Science and Technology, Trondheim, Norway

Hans Theliander, Chalmers University of Technology, Göteborg, Sweden

INTERNATIONAL SCIENTIFIC ADVISORY BOARD

Angelés Blanco, University Complutense of Madrid, Madrid, Spain

Emily D. Cranston, University of British Columbia, Vancouver, Canada

Patrick Gane, Aalto University (Professor emeritus), Espoo, Finland

Gil Garnier, Monash University, Melbourne, Australia

Øyvind Weibye Gregersen, Norwegian University of Science and Technology, Trondheim, Norway

Akira Isogai, University of Tokyo, Tokyo, Japan

Monika Österberg, Aalto University, Espoo, Finland

Herbert Sixta, Aalto University (Professor emeritus), Espoo, Finland

Per Stenius, Aalto University (Professor emeritus), Espoo, Finland

Hans Theliander, Chalmers University of Technology, Gothenburg, Sweden

DE GRUYTER

Please see the journal's homepage for Abstracting & Indexing Services information.

Published in cooperation with Royal Institute of Technology (KTH), Stockholm, Sweden and run as a project at KTH with Chalmers University of Technology, Karlstad University, Mid Sweden University, Swedish University of Agricultural Sciences, Norwegian University of Science and Technology, Aalto University, Åbo Akademi University, Luleå University of Technology and University of Oulu.

The publisher, together with the authors and editors, has taken great pains to ensure that all information presented in this work (programs, applications, amounts, dosages, etc.) reflects the standard of knowledge at the time of publication. Despite careful manuscript preparation and proof correction, errors can nevertheless occur. Authors, editors and publisher disclaim all responsibility for any errors or omissions of liability for the results obtained from use of the information, or parts thereof, contained in this work. The citation of registered names, trade names, trademarks, etc. in this work does not imply, even in the absence of a specific statement, that such names are exempt from laws and regulations protecting trademarks etc. and therefore free for general use.

ISSN 0283-2631 · e-ISSN 2000-0669

All information regarding notes for contributors, subscriptions, Open access, back volumes and orders is available online at <https://www.degruyterbrill.com/npprj>

EDITOR-IN-CHIEF Prof. Gunnar Henriksson, KTH Royal Institute of Technology, Division of Wood Chemistry and Pulp Technology, Teknikringen 56, 100 44 Stockholm, Sweden, e-mail: ghenrik@kth.se

JOURNAL COORDINATOR Dr. Gunda Stöber, De Gruyter, Genthiner Straße 13, 10785 Berlin, Germany, Tel.: +49 (0)30 260 05-279, e-mail: npprj.editorial@degruyterbrill.com

© 2025 Walter de Gruyter GmbH, Berlin/Boston

TYPESETTING TNQ Tech Private Limited, Chennai, India

PRINTING Franz X. Stückle Druck und Verlag e.K., Ettenheim

COVER ILLUSTRATION Mountain spruce forest, Kyushu, Japan. © GA161076/iStock/Getty Images Plus

Questions about General Product Safety Regulation: productsafety@degruyterbrill.com



Contents

Chemical Pulping

Marc Borrega, Marjo Määtänen, Ilkka Nurminen and Tarja Tamminen

Alkali-extracted spruce bark residues for pulping and making of pulp sheets — 647

Tianhao Huang, Yunxia Wang, Yi Hou and Xiangxing Liu

Applications of cationic bamboo fibers for the effective reinforcements of secondary fibers — 657

Paper Technology

Durairaj Jansirani, Sundararajan Aswini, Sivagurusamy Subathira and Muthiah Indiraleka

Improving hydrophobicity and mechanical strength of rice straw paper using chitosan nanoparticles and beeswax coatings — 667

Riku Pihko, Tuukka Verho and Jukka A. Ketoja

Extended wet pressing at elevated temperature enables enhanced dewatering for tissue and linerboard — 681

Muthumari Perumal, Varalakshmi Varatharajan, Senthil kumaar Jayalakshmi Sellappan, Kiruthick Balu Kaliraj and Madhavan Seenivasan

Tissue paper from cabbage leaf – waste paper mixtures — 691

Zinuo Meng, Jizhen Huang, Liangliang An, Changrong Shi, Ya Zhang, Wanruo Lei and Yuxin Liu

Inhibition of hornification in simao pine fibers and recycled paper with different beating degrees by microwave expansion treatment — 701

Weifeng Chen and Xiwen Wang

Preparation of mycelium paper sheets and study on their adsorption properties — 713

Paper Physics

Hao Sun, Jieyu Cui, Lingjun Wei, Zhiyi Wu, Haojin Li, Yunfeng Zhu and Wanlin Zhang

Influence of the hybrid effect on the mechanical properties of pulp molds — 727

Paper Chemistry

Linquan Fang, Hua Li and Jun Gao

Response surface methodology optimization and anti-age properties in paper protection of carboxymethyl cellulose grafted with β -cyclodextrin — 741

Printing

Nicky Rahmana Putra and Bramantyo Airlangga

Green innovations in natural paper ink: trends, applications, and future prospects — 753

Packaging

Heike Stotz, Matthias Klauser, Johannes Rauschnabel and Marek Hauptmann

Advanced moisture strategy for expanded formability in paper-based packaging — 777

Saleh Ghahramani, Sahab Hedjazi and Saeed Mahdavi

Production of packaging paper from *Populus deltoides* NSSC pulp reinforced with rice straw cellulose nanofibrils — 789

Environmental Impact

Jingran Peng, Yi Hou, Xiaoming Liu and Lirong Lei

Treatment of regenerated papermaking wastewater by sequencing batch moving bed biofilm reactor and kinetics study — 801