

TAPPI International Conference on Nanotechnology for Renewable Materials 2014

Vancouver, British Columbia, Canada
23-26 June 2014

ISBN: 978-1-5108-1567-4

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2014) by the TAPPI Press
All rights reserved.

Printed by Curran Associates, Inc. (2016)
For permission requests, please contact the TAPPI Press



at the address below.

TAPPI Press
15 Technology Parkway South
Peachtree Corners, Georgia 30092

Phone: (800) 332-8686
Fax: (770) 446-6947

memberconnection@tappi.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

SESSION 2: CNC PROCESSING

BLUE GOOSE BIOREFINERIES INC. METHOD FOR CELLULOSE NANOCRYSTALS PRODUCTION	1
<i>Sean McAlpine</i>	
COMPLETE MAPPING OF CELLULOSE NANOCRYSTAL (CNC) PRODUCTION PROCESS	7
<i>Junyong Zhu, Qianqian Wang</i>	
LOW COST CO-PRODUCTION OF CELLULOSE NANOFIBRILS AND/OR CELLULOSE NANOCRYSTALS WITH BIOFUELS USING AMERICAN PROCESS INC.'S AVAP® BIOREFINERY TECHNOLOGY	28
<i>Kimberly L. Nelson</i>	

SESSION 3: AEROGELS, HYDROGELS AND FOAMS I

INJECTABLE HYDROGELS AND LOW DENSITY AEROGELS CROSSLINKED WITH HYDRAZONE BONDS	38
<i>Emily Cranston, X. Yang</i>	
NANO-CELLULOSE AS A TEMPLATE FOR FUNCTIONAL MATERIALS PRODUCTION	49
<i>Ahu Gunrah Dumanli Parry</i>	

SESSION 4: CNF PROCESSING

FIBRILLATED CELLULOSE PRODUCTION – CHEMICALLY ASSISTED DISINTEGRATION OF THE FIBER CELL WALL	61
<i>Thaddeus Maloney, Zheng Honglian, Juuso Rantanen</i>	
AVOIDING AGGREGATION DURING THE DRYING AND REHYDRATION PHASES OF NANOCELLULOSE PRODUCTION	71
<i>Evelyn Fairman</i>	

SESSION 5: AEROGELS, HYDROGELS AND FOAMS II

THE STRUCTURE AND PROPERTIES OF CELLULOSE NANOCRYSTAL AEROGELS	99
<i>Christian Buesch, Han Chan, Peter Eschbach, John Simonsen</i>	
CNC AND CNF FOR COMPOSITE AND OTHER APPLICATIONS	114
<i>Junyong Zhu, Long Jian</i>	

SESSION 6: ALTERNATIVE SOURCES FOR CELLULOSE NANOMATERIALS

REINFORCEMENT OF PLA NANOCOMPOSITE WITH NANOCCLAY AND NANOCELLULOSE EXTRACTED FROM SISAL	132
<i>J. Trifolia, D. Plackett, C. Sillard, J. Bras, O. Hassager, A. E. Daugaard, P. Szabo</i>	

SESSION 7: COMPOSITES & COATING

PROCESSING-STRUCTURE-PROPERTY RELATIONSHIPS IN CELLULOSE NANOCRYSTAL/WATERBORNE EPOXY COMPOSITES	143
<i>Meisha Shofner</i>	

SOLID-STATE SHEAR PULVERIZATION AS EFFECTIVE TREATMENT FOR DISPERSING LIGNOCELLULOSE NANOFIBERS IN POLYPROPYLENE COMPOSITES	153
<i>Shinichiro Iwamoto, Takashi Endo</i>	

SESSION 8:CELLULOSE NANOPARTICLE CHARACTERIZATION

ON THE CELLULOSE SUPRAMOLECULAR STRUCTURE IN VARIOUS CELLULOSE-I CNCS	162
<i>Umesh P. Agarwal</i>	
CNC CHARACTERIZATION: AN ESSENTIAL STEP TOWARDS PROFILING PHYSICOCHEMICAL PROPERTIES	177
<i>Christophe Danumah</i>	
RECENT DEVELOPMENTS IN NANO-LIGNO-CELLULOSE PRODUCTION AND THE CRILL CHARACTERIZATION TECHNIQUE	193
<i>Sinke Henshaw Osong</i>	

SESSION 9: COMPOSITES & COATINGS

STRUCTURAL NANOCELLULOSE COMPOSITES	206
<i>Jeffrey P. Youngblood, Jen-Chieh Liu</i>	
IMPROVEMENTS IN MECHANICAL RESPONSE AND LIQUID BARRIER PROPERTIES OF CELLULOSIC SUBSTRATES WITH BLENDED POLYSACCHARIDE COATINGS	218
<i>Adam R. Plucinski, Jeffery Catchmark</i>	
CHEMICAL SURFACE ANALYSIS AND CLASSIFICATION OF HYDROPHOBIC NANOPARTICLE COATINGS ON PAPER BY PRINCIPAL COMPONENT ANALYSIS	245
<i>Pieter Samyn</i>	

SESSION 11: KEYNOTE PRESENTATION

COMMERCIAL BREAK-THROUGH IN MFC PROCESSING	263
<i>Per Svending</i>	

SESSION 12: MARKETS FOR CELLULOSE NANOMATERIALS

CELLUFORCE: PROGRESS TOWARDS COMMERCIALIZATION	281
<i>Richard M. Berry</i>	
MARKET PROJECTIONS FOR NANOCELLULOSE-ENABLED PRODUCTS	293
<i>Jo Anne Shatkin, John Cowie, Theodore Wegner</i>	
NANOCELLULOSE MARKETS	304
<i>Jack Miller</i>	

SESSION 13: HYBRID MATERIALS

ELECTROSPUN CHITOSAN-POLYETHYLENE OXIDE NANOFIBRES FOR ADSORPTION OF COPPER IONS FROM AQUEOUS SOLUTIONS	318
<i>Ichrak Lakhdhar, Bruno Chabot, Patrice J. Mangin</i>	

SESSION 14: APPLICATIONS

MITIGATING SHRINKAGE IN CONCRETE STRUCTURES THROUGH CELLULOSE NANOMATERIALS	340
<i>Vivek Bindiganavile, Yaman Boluk, Muhammad Mamun, Sudeshna Saha</i>	

SYNTHESIS OF CELLULOSE NANOCRYSTALS CARRYING TYROSINE SULFATE MIMETIC LIGANDS AND INHIBITION OF ALPHAVIRUS INFECTION	355
<i>Justin Zoppe</i>	

SESSION 15: RHEOLOGY I

RHEOLOGICAL STUDIES ON THE INTERACTIONS BETWEEN CELLULOSE NANOCRYSTALS AND POLYMERS	366
<i>Liyan Zhao</i>	
THE BLADE COATING OF CELLULOSE NANOFIBERS SUSPENSIONS ON PAPER	375
<i>Mike Bilodeau, Finley Richmond</i>	
TUNING CELLULOSE NANOCRYSTAL GELS AND EMULSIONS USING POLYMERS AND SURFACTANTS	388
<i>Emily Cranston</i>	

SESSION 16: PAPER & PAPERBOARD APPLICATIONS

THE ADDITION OF CNF TO PAPERMAKING FURNISH	401
<i>Donna A. Johnson</i>	
IMPACT ON PAPER PROPERTIES OF Z-DIRECTION STRUCTURING BY THE LAYERED ADDITION OF MICRO-NANO-FIBRILLATED CELLULOSE (MNFC)	423
<i>Mohamed A. Charfeddine, Patrice J. Mangin</i>	
BINDING FILLERS FOR HIGH FILLER CONTENT PAPERS BY USING MFC	439
<i>Katariina Torvinen, E. Hellen</i>	
DEVELOPMENT OF MICROFIBRILLATED CELLULOSE COMPOSITE WEB FORMING METHOD	451
<i>Juuso Rantanen, Juuso Rantanen</i>	

SESSION 17: RHEOLOGY II

STABILITY AND RHEOLOGY OF CELLULOSE NANOCRYSTAL SOLUTIONS IN ADSORBING AND NON-ADSORBING POLYMERS SOLUTIONS	461
<i>Hale Oguzlu</i>	
DISPERSION OF MICRO-NANO FIBRILLATED CELLULOSE (MNFC) BY CARBOXY METHYL CELLULOSE (CMC) AND ITS CHARACTERIZATION	473
<i>Fabrice Roussiere, Patrice J. Mangin, Pierre Carreau</i>	
RHEOLOGY AND CONSOLIDATED STRUCTURE OF MFC/NFC-CONTAINING COATING COLOURS: STRUCTURE–LIQUID INTERACTIONS	490
<i>Katarina Dimic-Misic</i>	

SESSION 18: MEDICAL I: BIOMEDICAL SCAFFOLDS FROM CELLULOSE

TISSUE ENGINEERING SCAFFOLDS FROM ELECTROSPUN ALL-CELLULOSE NANOCOMPOSITE NANOFIBERS REINFORCED WITH CELLULOSE NANOCRYSTALS	503
<i>Wei Zhang, Xu He, Canhui Lu</i>	
MORPHOLOGICAL, STRUCTURAL, MECHANICAL PERFORMANCE AND IN VITRO BIOACTIVITY OF CELLULOSE NANOCRYSTALS REINFORCED BIOCOMPOSITE SCAFFOLDS FOR BONE TISSUE ENGINEERING	522
<i>Yuvraj Singh Negi</i>	

SESSION 19: CNC SELF ASSEMBLY

CELLULOSE NANOCRYSTAL SELF-ASSEMBLY AND LIQUID CRYSTAL BEHAVIOUR DURING STORAGE	545
<i>Stephanie Beck</i>	

CELLULOSE BIOMIMETIC: A NEW PROSPECTIVE FOR SMART MATERIALS	560
<i>Silvia Vignolini, Ahu Gunrah Dumanli Parry, Ullrich Steiner</i>	
RESPONSIVE PHOTONIC HYDROGELS TEMPLATED BY THE SELF-ASSEMBLY OF CELLULOSE NANOCRYSTALS	576
<i>Joel A. Kelly, Mark MacLachlan, Kevin Shopsowitz, Wadood Y. Hamad</i>	

SESSION 20: MEDICAL II: DRUG DELIVERY

PREP AND CHARACTERIZATION OF CELLULOSE NANOFIBRIL BASED HYDROGELS FOR DRUG RELEASE SYSTEMS	587
<i>Byung-Dae Park</i>	

SESSION 21: SURFACE FUNCTIONALIZATION

(BIO) CHEMICAL APPROACHES TO (BIO) FUNCTIONAL CELLULOSE: APPLICATION OF CARBOHYDRATE ENZYMOLOGY AND CELL WALL BIOMIMETICS TO CELLULOSE SURFACE MODIFICATION	601
<i>Harry Brumer</i>	
THERMALLY STABLE CELLULOSE NANOCRYSTALS: FROM FORM TO SMART FUNCTIONALITY	615
<i>Johan Foster</i>	
SILVER NANOPARTICLES ON PAPERBOARD FOR SURFACE-ENHANCED RAMAN SCATTERING (SERS) SENSING	627
<i>Jarkko J. Saarinen</i>	

SESSION 22: MEDICAL III: ANTIMICROBIAL AND ANTIBACTERIAL FUNCTIONALITY

SYNTHESIS, CHARACTERIZATION AND ANTIMICROBIAL ACTIVITY ASSESSMENT OF SURFACE MODIFIED MICROFIBRILLATED CELLULOSE	637
<i>Seema Saini, Mohamed Belgacem, Julien Bras</i>	
ELABORATION OF A NEW ANTIBACTERIAL BIO-NANO-MATERIAL FOR FOOD-PACKAGING BY SYNERGISTIC ACTION OF CYCLODEXTRIN AND MICROFIBRILLATED CELLULOSE	651
<i>Julien Bras, Isabelle Desloge, Nathalie Lavoine, Nicolas Tabary</i>	

SESSION 23: MODELING

INTERACTION FORCES BETWEEN CELLULOSE NANOCRYSTAL PARTICLES IN AQUEOUS SOLUTIONS	670
<i>Yaman Boluk</i>	
PLANT BIOMASS RECALCITRANCE: MOLECULAR THEORY OF SOLVATION REVEALS NANOSCALE FORCES THAT CONTROL CELL WALL STRENGTH	683
<i>Andriy Kovalenko</i>	

SESSION 24: ENVIRONMENTAL, HEALTH & SAFETY

EFFECT OF POLYMERIC NANOPARTICLES ON THE STABILITY OF A BIOMIMETIC MODEL OF THE LUNG SURFACTANT	697
<i>Patrick Lai</i>	

SESSION 26: PANEL DISCUSSION

MANUFACTURE, MARKETS AND COMMERCIALISATION	708
<i>Richard Berry</i>	

MARKET PROSPECTS FOR CRYSTALLINE CELLULOSE	713
<i>Bruce Lyne</i>	
BETULIUM LTD HIGH VALUE FOREST PRODUCTS	726
<i>Antti Laukkanen</i>	
Author Index	