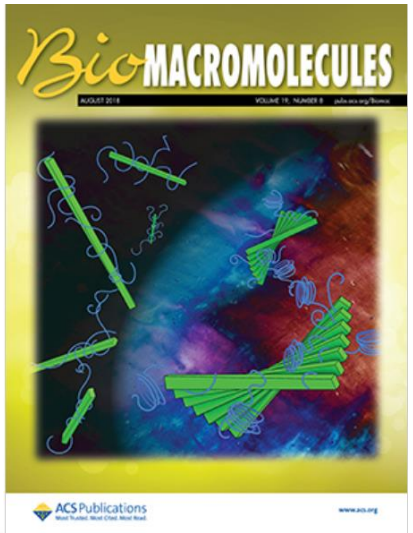
2018 BiCMat

Bio-based Colloids & Materials

Annual Report

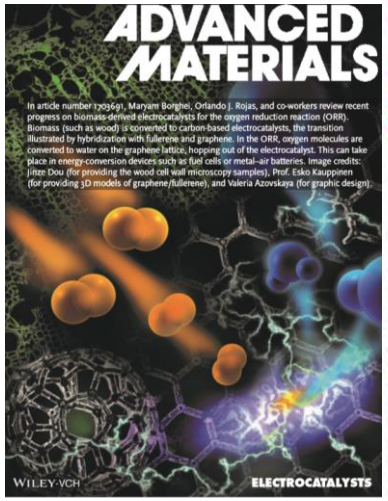
Research Strategy

Our core activities involve biobased materials at different size scales, mainly those displaying large interfacial areas such as fibers (micro/nano fibers), fiber networks, particles, colloids and multiphase systems.



Focus areas

- Nano/microfibrillar ligno-cellulose, nanocrystals & bacterial cellulose. Nanochitin and dairy colloids
- Multiphase systems: dispersions, foams, gels, membranes and aerogels.
- Stimuli-responsive materials.
- Proteins, enzymes and (bio)sensing.



Index

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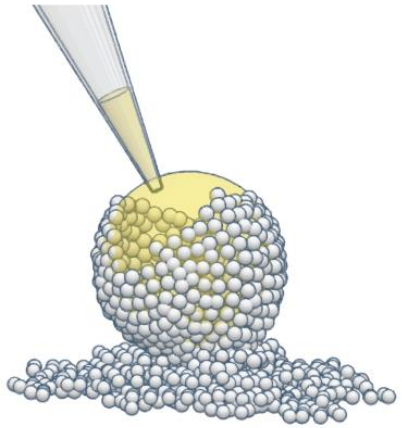
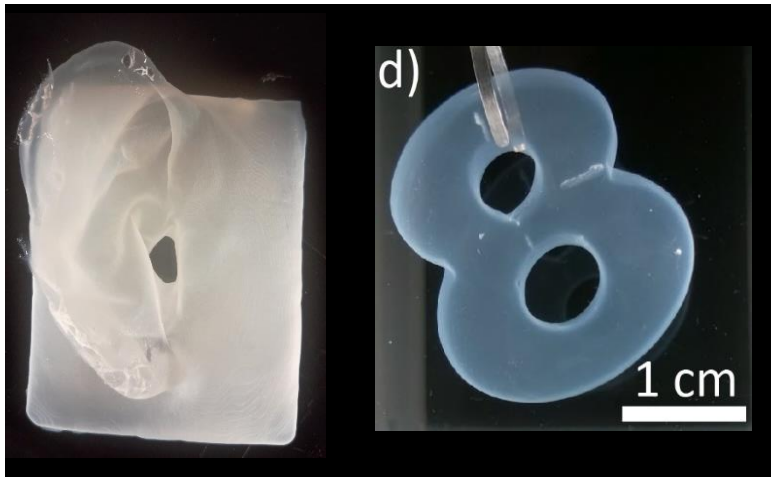
2018 highlight 1

Biobased Colloids and Materials (BiCMat) group

Topic	**Biofabrication of multifunctional nanocelullosic 3D structures**
What?	Novel approach to integrate biofilms in the development of advanced materials
How?	Cellulose-producing microorganisms form membranes inside designed shapes that follow the “liquid marble” framework
Possible application	Tissue engineering, biomedical; organ (bio)printing; capsule-in-capsule solutions; multi-compartmentalization; food



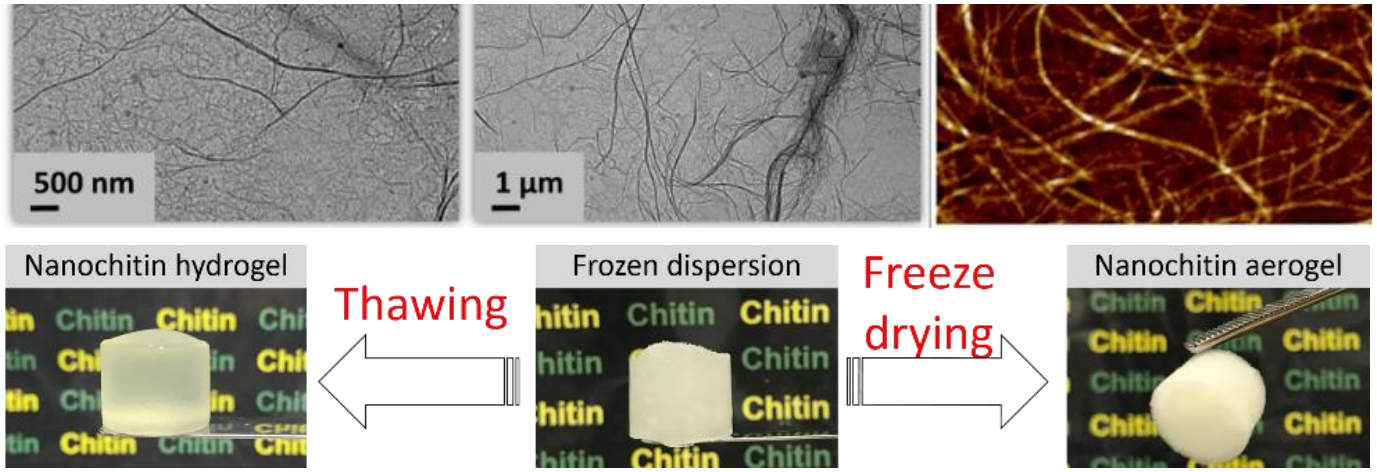


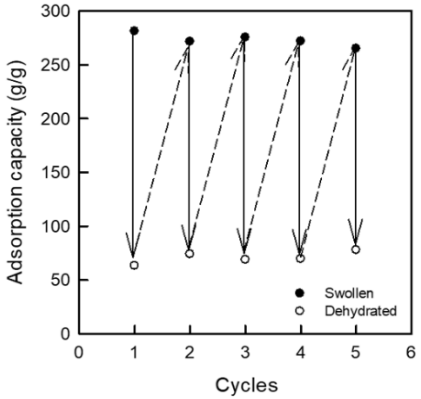
Greca, Lehtonen, Tardy, Guo, Rojas, **Materials Horizons** (2018), DOI: 10.1039/C7MH01139C

2018 highlight 2

Biobased Colloids and Materials (BiCMat) group

Topic	**High axial ratio nanochitins for ultra-strong and shape-recoverable hydrogels and cryogels**
What?	Nanochitin is produced at low energy and high yield (~90%) to produce ulra-elastic hydrogels and cryogels
How?	Following hydrolysis for partial deacetylation of chitin, nanofibrils ultra-high axial size (500) are produced. Ice templating upon freezing and thawing is performed with simultaneous crosslinking.
Possible application	Antibacterial and antifungal systems for thermal insulation and air filtration. Drug delivery.

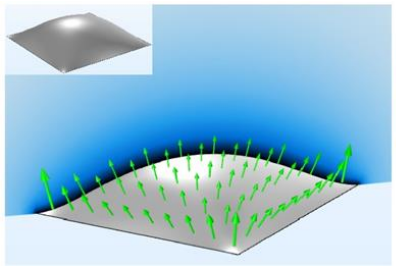
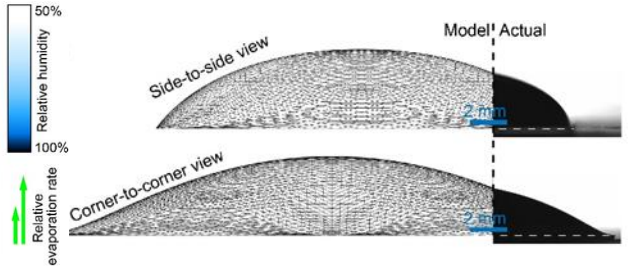
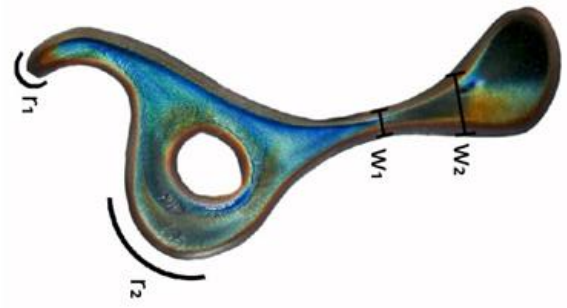
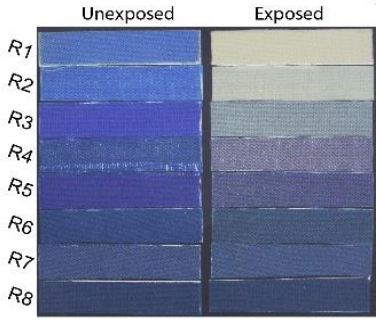




Liu, Bai, Tripathi, Yu, Wang, Borghei, Fan, Rojas, **ACS Nano**, (2019)

2018 highlight 3

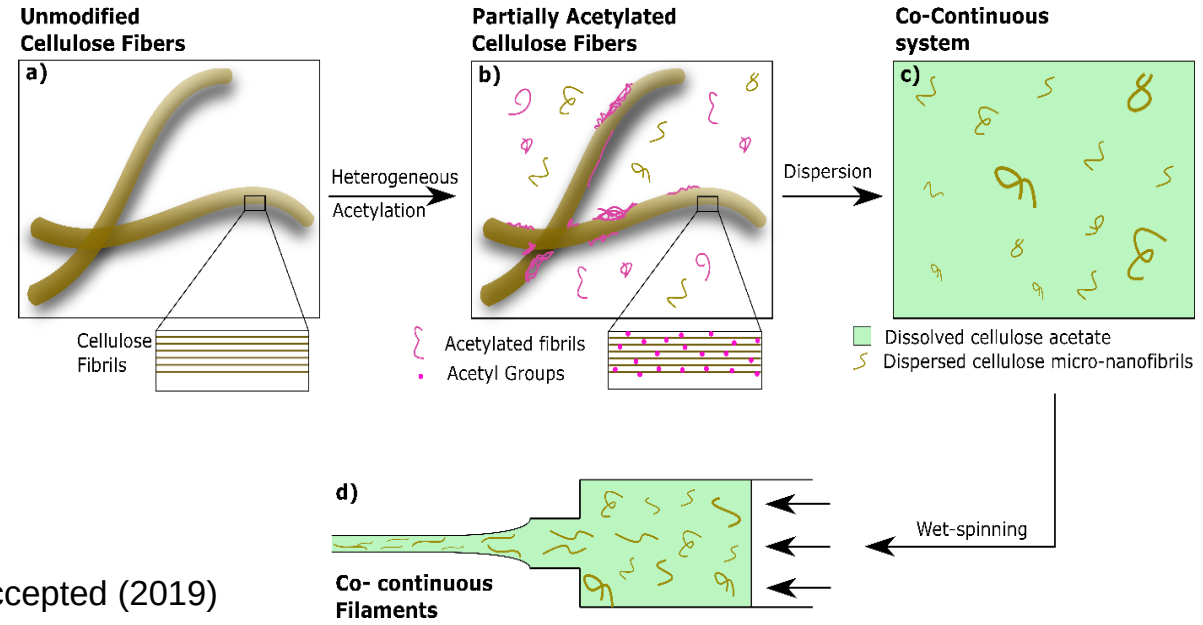
Biobased Colloids and Materials (BiCMat) group

Topic	**CNC for structural color and coffee rings effects via drying flux inhomogeneities**
What?	Cross-disciplinary work with ART and CHEM to exploit coffee ring effects from cellulose nanocrystals and produce visual designs
How?	     Klockars, Yau, Tardy, Majoinen, Kämäräinen, Miettunen, Boutonnet, Borghei, Beidler, Rojas, Cellulose, (2019). DOI: 10.1007/s10570-018-
Possible application	Non-fading coatings in textiles; future design of materials for photonics application using reflection from nano-scaled architectures.

2018 highlight 4

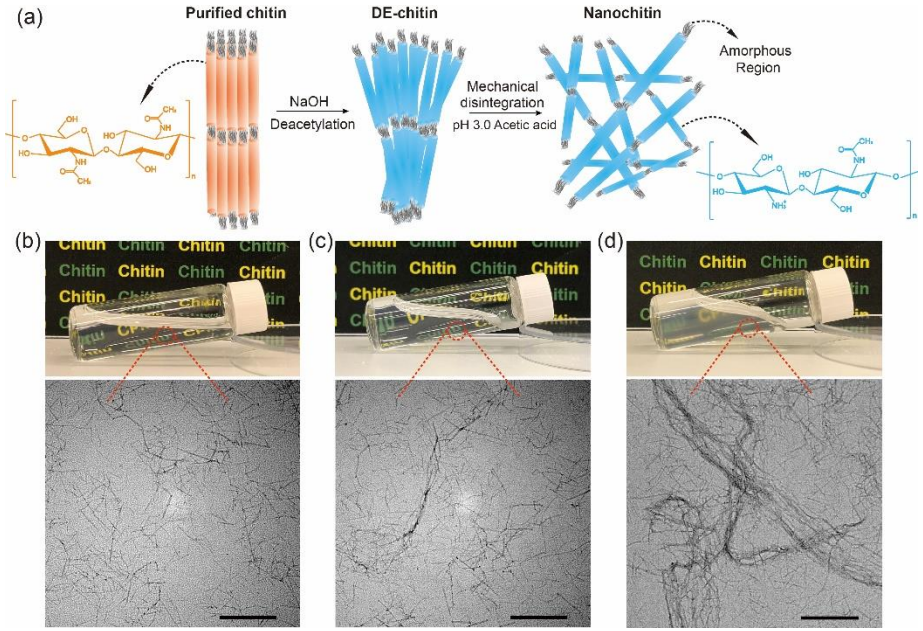
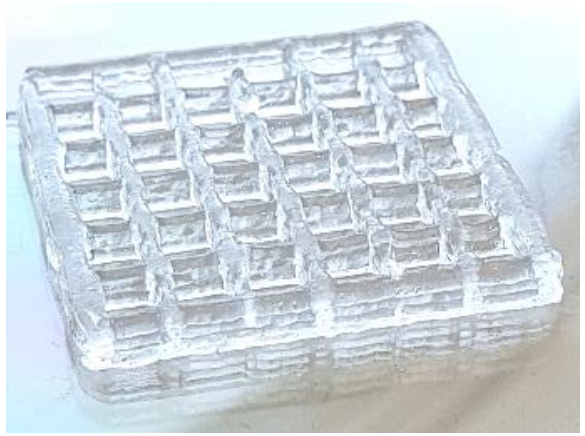
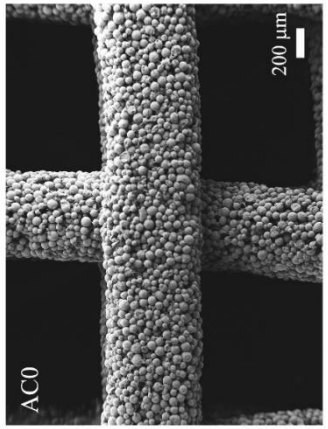
Biobased Colloids and Materials (BiCMat) group

Topic	**Micro- and nanocelluloses for the synthesis of highly-stretchable, tough and water-resistant co-continuous filaments**
What?	Heterogeneous acetylation of wood fibers weakens interfibrillar hydrogen bonding, which facilitates microfluidization and formation of continues filaments
How?	Suspension forms a co-continuous assembly with a matrix that interacts strongly with the micro- and nanofibrils in the dispersed phase. This facilitates uninterrupted and defect-free wet-spinning. Tripathi, Ago, Khan, Rojas, **ACS Applied Materials and Interfaces**, Accepted (2019)
Possible application	Advanced filaments that are water resistant, with remarkable stretchability (30 %) and ultra-high toughness.



2018 highlight 5

Biobased Colloids and Materials (BiCMat) group

Topic	**Short and long nanochitin for oil/water interfacial super-stabilization and 3D printing**
What?	Nanochitins of various aspect ratio are produced and used to achieve super-stable emulsions
How?	   Bai, Huan, Xiang, Nugroho, Rojas et al., **Green Chemistry**, 20, 1571(2018). DOI: 10.1039/C8GC00134K; **Biomacromolecules**, 19, 1674 (2018). DOI: 10.1021/acs.biomac.8b00233; **ACS Sustainable Chem & Eng** (2019)
Possible application	Structural food; 3D printing and advanced materials

5 BiCMat senior members and postdocs joined in 2018

1. Johanna Majoinen, Surface functionalization, Polymer self-assembly
2. Jukka Hassinen, Nanoparticle clusters (current, manager CERES Flagship)
3. Rafael Grande, Interpolyelectrolyte complexes
4. Bruno Mattos, supracolloids, controlled release
5. Robertus Nugroho, Biocolloidal powders

7 BiCMat PhD students joined in 2018

1. Bin Zhao – Ph.D., Bioproducts and Biosystems, Chem. Eng, Aalto University
2. Eva Pasquier – Ph.D., Bioproducts and Biosystems, Chem. Eng, Aalto University (with Grenoble INP – Pagora, France, Prof. Julien Bras, co-supervisor):
3. Ya Zhu – Ph.D., Bioproducts and Biosystems, Chem. Eng, Aalto University (with College of Material Science and Engineering, Northeast Forestry University, China)
4. Xiao Zhang – Ph.D., Bioproducts and Biosystems, Chem. Eng, Aalto University
5. Saara Lähtevänoja – Ph.D., Bioproducts and Biosystems, Chem. Eng, Aalto University
6. Katariina Solin – Ph.D., Bioproducts and Biosystems, Chem. Eng, Aalto University
7. Konrad Klockars – Ph.D., Bioproducts and Biosystems, Chem. Eng, Aalto University

2 BiCMat MS & Licentiate students joined in 2018

1. Mikko Laine (current)– M.S., Bioproducts and Biosystems, Chem. Eng, Aalto University:
2. Olli Lehtinen (current)– Licentiate., Bioproducts and Biosystems, Chem. Eng, Aalto University

Summer and temporal researchers

Stefan Winklehner, Mahdi Rafee, Amal Ishfaq, Michael Rale

7 BiCMat members graduated (PhD)

1. Meri Lundahl (Aalto University)– Ph.D., Chem. Eng, Aalto University: Wet-spinning of cellulose nanofibrils hydrogels, 2018.

2. Ahsan Uddin (Tampere University, Finland)– Ph.D., Chem. Eng, Aalto University: Nanocellulose for control synthesis of nanoparticles and antimicrobial applications, 2018.

3. Sanna Virtanen – Ph.D., Bioproducts and Biosystems, Chem. Eng, Aalto University From wood to industrial polymeric biomaterials, August 2018.

4. Anurodh Tripathi (NCSU, USA) – Ph.D., Chemical and Biomolecular Engineering, NCSU: Porous and light-weight cellulose diacetate structures for environmental remediation, July 2018 (co-advisor: Prof. Saad Khan)

5. Joe Lavoie (Glen Raven, USA) – Ph.D., Chemical and Biomolecular Engineering, NCSU: Approaches for Surface Energy Control of Nonwoven Fibers for Alcohol Repellency and Electret Charge Protection, February 2018 (co-advisor: Prof. Saad Khan).

6. Prajesh Adhikari (Intel, USA) – Ph.D., Chemical and Biomolecular Engineering, NCSU: Developing New Multicomponent Systems: From Coatings, Gels to Nanofiller Composites, January 2018 (co-advisor: Prof. Saad Khan).

5 BiCMat members graduated (M.S.)

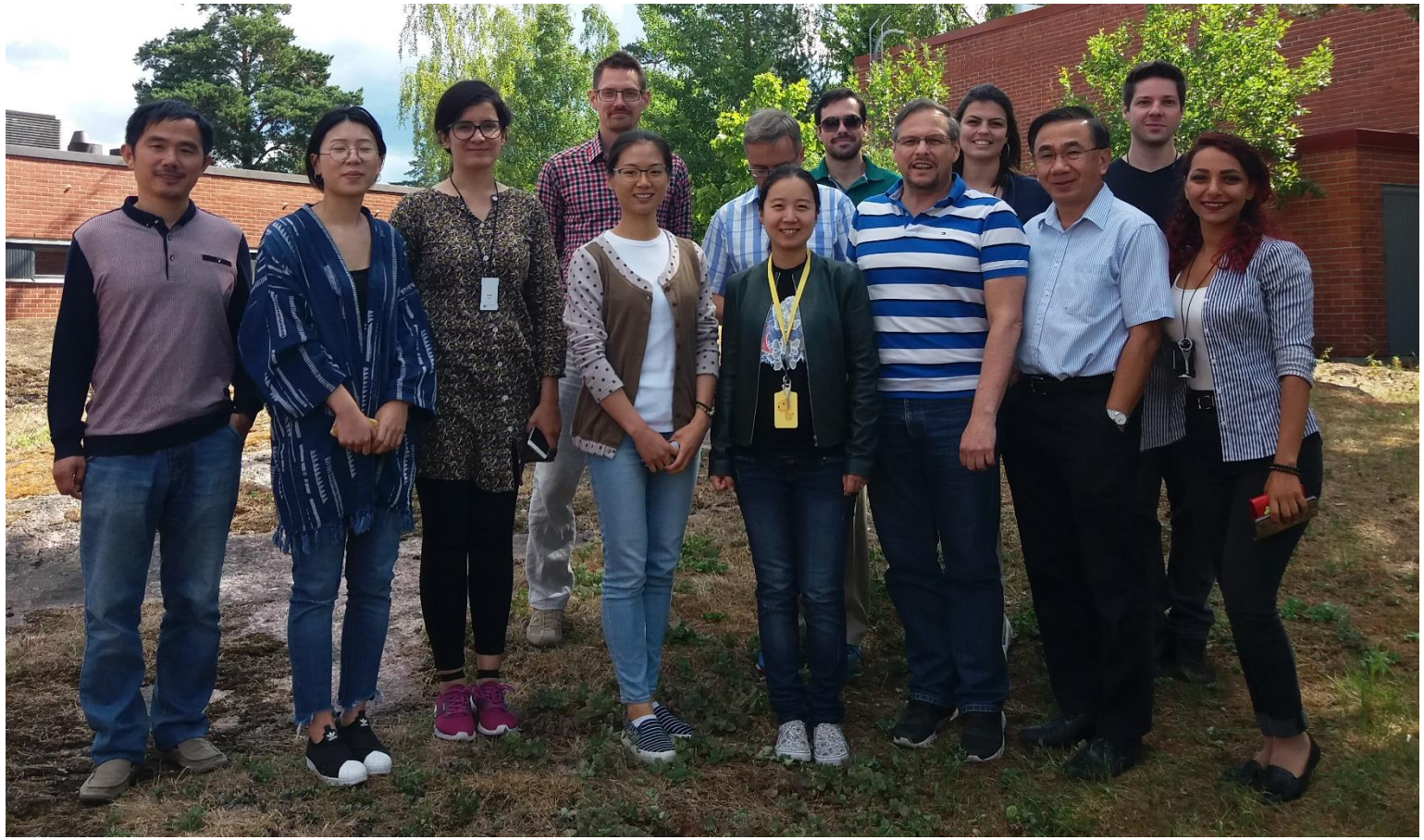
1. Amal Ishfaq– M.S., Bioproducts and Biosystems, Chem. Eng, Aalto University: Comparison of the surface activity of hemicelluloses extracted from spruce and birch sawdusts, November 2018.
2. Sonja Päärnilä – M.S., Bioproducts and Biosystems, Chem. Eng, Aalto University: Lignin films - production and characterization, June 2018.
3. Katariina Solin – M.S., Bioproducts and Biosystems, Chem. Eng, Aalto University: Bioactive Nanocellulose Films with Spatial Definition, May, 2018.
4. Klockars Konrad – M.S., Bioproducts and Biosystems, Chem. Eng, Aalto University: Evaporation-induced self-assembly of cellulose nanocrystals from aqueous suspensions into chiral nematic solid structures, April, 2018.
5. Riikka Virtanen– M.S., Bioproducts and Biosystems, Chem. Eng, Aalto University: Towards bioengineered alginates – comparison of bacterial and algal alginates regarding gelling properties and spinnability, April 2018.

21 Visiting Scholars Hosted by the Group in 2016

1. Hongbin Xie, School of Bioresources Chemical and Materials Engineering, Shaanxi University of Science and Technology
2. Lin Li, School of Bioresources Chemical and Materials Engineering, Shaanxi University of Science and Technology
3. Peiyao Wang, School of Bioresources Chemical and Materials Engineering, Shaanxi University of Science and Technology
4. Xiaoli Zhen,School of Bioresources Chemical and Materials Engineering, Shaanxi University of Science and Technology
5. Gabriela Berto, Escola de Engenharia de Lorena, Universidade de São Paulo
6. Xiao Zhang, College of Material Science and Engineering, Northeast Forestry University, Design and Preparation of functionalized lignin supramolecular microparticles for stabilizing Pickering emulsion and emulsion polymerization
7. Yang Meng, College of Materials Science and Technology, Beijing Forestry University (BFU), Phase changing materials from lignocellulose
8. Carlos Eduardo Silveira da Silva, Ciências Ambientais e Florestais, UFRRJ, Brasil
9. Gabriela L. Berto, Biomass deconstruction
10. Prof. Michael Tam, University of Waterloo, Canada, 3 months
11. Elisa Boutonnet, Pagora - Grenoble-INP, France, 2 months
12. Judith Vergara, Ph.D. student, University of Bio-Bio, Chile, 2 months
13. Alexander Gaitan, Ph.D. student, University of Bio-Bio, Chile, 2 months
14. Niu Xun, , Ph.D. student, College of Chemical Engineering, Nanjing Forestry University, 6 months
15. Nabila Febriani, Ph.D. student, Advanced Textile Engineering Department, Shinshu University, South Korea, 5 months

Visiting Scholars Hosted by the Group in 2016

16. Antonio Maria Borrero Lopez. Ph.D. student, Química Física y Ciencia de los Materiales, Universidad de Huelva, Spain, 3 months
17. Carmen Hervés. Ph.D. student, ute for Advanced Chemistry of Catalonia, Spanish National Research Council, Spain, 3 months
18. Prof. Guihua Yang, Qilu University, China, Nanocomposites, 3 months.
19. Prof. Haiming Li, Dalian Polytechnic University, Nanocellulsoe in 3D printing, 1 year
20. Dr. Marco Beaumont, University of Natural Resources and Life Sciences (BOKU), Vienna, Austria, Cellulose Nanoparticles, 2 months
21. Jorge Luengo, CMPC, Chile



Awards and personnel highlights 2018

- **Distinguished Professor,** College Chem. Engineering, Nanjing Forestry University, China.
- **Anselme Payen Award,** highest honor in the area of Cellulose and Renewable Materials
- **Act of the Year 2018, Aalto University**
- **EU Commission ERC Advanced grant,** the most competitive project award in the EU for established scientists
- Academy of Finland **FinnCERES Bioeconomy** Flagship (2018-)

CERES Flagship – Competence Center for the materials Bioeconomy: A Flagship for our Sustainable Future (Aalto University, VTT Technical Research Centre of Finland Ltd) CERES Materials Cluster	Academy of Finland	9,332,800 (1st term) (total of 24 MEUR for 8 years until 2025)	01.05.2018 - 31.12.2022
BioELCell-Bioproducts Engineered from Lignocelluloses: from plants and upcycling to next generation materials, 788489 European Research Council Established by the European Commission	European Research Commission - ERC Advanced Grant	2,500,000	01.08.2018 - 31.07.2023

Awards and personnel highlights 2018 (Cont'd)

1. Annamari Jukkola starts Mö Foods Oy
2. Luiz Greca: 2nd term CHEM Fellowship Aalto Doctoral Program in Chemical Technology, Aalto University (based on competitive projects)
3. Jiaqi Guo: Alexander von Humboldt fellowship
4. Blaise Tardy best oral presentation Department Seminar
5. Ling Wang travel PI award
6. Wenchao Xiang PI travel award
7. Janika Lehtonen, fellowship to Australia
   Blaise most productive HYBER member (postods pool)
   Luiz most productive HYBER member (PhDs student pool)

Committee membership

1. Aalto University Materials Platform, chair
2. Tappi Research Committe Nnaotechnology of Renewable Materials, co-chair
3. Serra Húnter Programme (SHP) fostered by the Government of Catalonia and the Catalan public universities for Appointment of Assistant Professor in UPC-Terrassa

PhD Committees:

1. Diana Rayes, Department of Chemistry, Umeå University, 2018
2. Selin Vitas, ETH Zürich, Institute for Building Materials, Wood Materials Science
3. Petteri Parkkila, University of Helsinki, 2018 (1)
4. Engku Arisyah Binti Tengku Yasim Anuar, Universiti Putra Malaysia, 2018

Opponent duties 2018

1. Anna Ottenhall, “Antimicrobial materials from cellulose using environmentally friendly techniques”, KTH Royal Institute of Technology, School of Engineering Sciences in Chemistry, Department of Fibre and Polymer Technology, Stockholm, Sweden, December 7, 2018.
2. Yingxin Liu, “Nanocellulose-based materials: from colloidal assembly to functional films”, University of Stockholm, Sweden, June 7, 2018.
3. Emelie Norström “Hemicelluloses and other Polysaccharides for Wood Adhesive Applications”, KTH Royal Institute of Technology, School of Engineering Sciences in Chemistry, Biotechnology and Health, Department of Fibre and Polymer Technology, Stockholm, Sweden, June 11, 2018.
4. Patrick Laurén, “Biomedical applications of nanofibrillar cellulose”, Division of Pharmaceutical Biosciences, Faculty of Pharmacy, University of Helsinki, Finland, June 29, 2018.
5. Kajsa Markstedt, “3D Printing Wood Tissue”, Department of Chemistry and Chemical Engineering, Chalmers University of Technology, Sweden, June 1, 2018.

Evaluation of Promotion and Tenure

1. Lianbiong Hu to the rank of Full Professor, University of Maryland,.
2. Mehdi Tajvidi to the rank of Associate Professor in Maine University, USA
3. Carmen Freire, University of Alveiro, Portugal .

Peer-reviewed journal publications 2018 (46)

1. Tripathi A., Ago M., Khan S., **Rojas O.J.**, Heterogeneous Acetylation of Plant Fibers into Micro- and Nanocelluloses for the Synthesis of Highly-stretchable, Tough and Water-Resistant Co-continuous Filaments via Wet-Spinning, **ACS Applied Marterials and Interfaces**, Accepted (2019)
2. Liu L., Bai L., Tripathi A., Yu J., Wang Z., Borghei M., Fan Y., **Rojas O.J.**, High Axial Ratio Nanochitins for Ultra-Strong and Shape-Recoverable Hydrogels and Cryogels via Ice Templating, **ACS Nano**, Accepted (2019)
3. Klockars K.W., Yau N.E., Tardy B.S., Majoinen J., Kämäräinen T., Miettunen K., Boutonnet E., Borghei M., Beidler J., **Rojas O.J.**, Coffee rings from cellulose nanocrystals and visual designs from drying flux inhomogeneities, **Cellulose**, Accepted (2019). DOI: 10.1007/s10570-018-2167-7
4. Toivonen M. S., Onelli O., Jacucci G., Lovikka V., **Rojas O.J.**, Ikkala O., Vignolini, S., Anomalous Diffusion-Assisted Brightness in White Cellulose Nanofibril Membranes, **Advanced Materials**, 1704050 (2018). DOI: 10.1002/adma.201704050
5. Tripathi A., Parsons G.N., Khan S.A., **Rojas O.J.** Synthesis of organic aerogels with tailorable morphology and strength by controlled solvent swelling following Hansen solubility, **Scientific Reports**, 8, 2106 (2018). DOI: 10.1038/s41598-018-19720-4
6. Jukkola A., Partanen R., **Rojas O.J.**, Heino A., Effect of heat treatment and pH on the efficiency of micro-diafiltration for the separation of native fat globules from cream in butter production, **Journal of Membrane Scienc**e, 548, 99-107 (2018). DOI: 10.1016/j.memsci.2017.11.012
7. Guo J., Filpponen I., Johansson L-S., Heiβler S., Li L., Levkin P., **Rojas O.J.**, Micro-patterns on nanocellulose films and paper by photo-induced thiol-yne click coupling: a facile method toward wetting with spatial resolution, **Cellulose**, 25, 367–375 (2018). DOI: 10.1007/s10570-017-1593-2
8. de Assis C.A., Iglesias M.C., Bilodeau M., Johnson D., Phillips R., Peresin M.S., Bilek T., **Rojas O.J.**, Venditti, R., Gonzalez R. Cellulose Micro- and nanofibrils (CMNF) Manufacturing - Risk and Financial Assessment, **Biofuels, Bioproducts & Biorefining**, 12, 251–264 (2018). DOI: 10.1002/bbb.1835

Peer-reviewed journal publications 2018 (46), cont'd

9. Li S., Xie W., Wilt M., Willoughby J.A., **Rojas O.J.**, Thermally stable and tough coatings and films using vinyl silylated lignin, **ACS Sustainable Chemistry & Engineering**, 6, 1988–199 (2018). DOI: 10.1021/acssuschemeng.7b03387
10. Kontturi E., Laaksonen P., Linder M., Nonappa, Gröschel A.H., **Rojas O.J.**, Ikkala O.J., Novel materials through assembly of nanocelluloses, **Advanced Materials**, DOI: 10.1002/adma.201703779
11. Carrillo I., Mendonça R.T., Ago M., **Rojas O.J.**, Comparative study of cellulosic components isolated from different Eucalyptus species, **Cellulose**, 25, 1011–1029 (2018). DOI: 10.1007/s10570-018-1653-2
12. Orelma H., Virtanen T., Spoljaric S., Lehmonen J., Seppälä J., **Rojas O.J.**, Harlin A., Cyclodextrin-functionalized fiber yarns spun from deep eutectic cellulose solutions for non-specific hormone capture in aqueous matrices, **Biomacromolecules**, 19, 652–661 (2018). DOI: 10.1021/acs.biomac.7b01765
13. de Matos M., Mattos B.D., Tardy L.B., **Rojas O.J.**, Magalhães W.L.E., Use of biogenic silica in porous alginate matrices for sustainable fertilization with tailored nutrient delivery, **ACS Sustainable Chemistry & Engineering**, 6, 2716–2723 (2018). DOI: 10.1021/acssuschemeng.7b04331
14. Eisa W.H., Abdelgawad A.M**.,** **Rojas O.J.**, Solid-state synthesis of metal nanoparticles supported on cellulose nanocrystals and their catalytic activity, **ACS Sustainable Chemistry & Engineering**, 6, 3974–3983 (2018). DOI: 10.1021/acssuschemeng.7b04333
15. Tardy B.L., Richardson J.J., Guo J., Lehtonen J., Ago M., **Rojas O.J.**, Lignin Nano- and Microparticles as Template for Nanostructured Materials: Formation of Hollow Metal-Phenolic Capsules, **Green Chemistry**, 20, 1335-1344 (2018). DOI: 10.1039/C8GC00064F (2018)
16. Toikkanen O., Outinen M., Malafronte L., **Rojas O.J.**, Formation and structure of insoluble particles in reconstituted model infant formula powders, **International Dairy Journal**, 82, 19-27 (2018). DOI: 10.1016/j.idairyj.2018.03.001
17. Özkan M., Borghei M., Karakoç A., **Rojas O.J.**, Paltakari J., Films based on crosslinked TEMPO-oxidized cellulose and predictive analysis via machine learning, **Scientific Reports**, 8,4748 (2018). DOI: 10.1038/s41598-018-23114-x

Peer-reviewed journal publications 2018 (46), cont'd

18. Bai L., Huan S., Xiang W., **Rojas O.J.**, Pickering emulsions by combining cellulose nanofibrils and nanocrystals: Phase behavior and depletion stabilization, **Green Chemistry**, 20, 1571-1582 (2018). DOI: 10.1039/C8GC00134K
19. Greca L.G., Lehtonen J., Tardy B.L., Guo J., **Rojas O.J.**, Biofabrication of multifunctional nanocellulosic 3D structures: a facile and customizable route, **Materials Horizons**, 5, 408-415 (2018). DOI: 10.1039/C7MH01139C
20. Khakalo A., Filpponen I., **Rojas O.J.**, Protein-mediated interfacial adhesion in composites of cellulose nanofibrils and polylactide: Enhanced toughness towards material development, **Composites Science and Technology**, 160, 145-151 (2018). DOI: 10.1016/j.compscitech.2018.03.013
21. Mattos B., Tardy B.L., Mohammadi P., Kämäräinen T., Linder M., Schreiner W., Magalhães W., **Rojas O.J.**, Controlled biocide release from hierarchically-structured biogenic silica: surface chemistry to tune release rate and responsiveness, **Scientific Reports**, 8:5555 (2018). DOI: 10.1038/s41598-018-23921-2SREP-17-54177
22. Borghei M., Miettunen K., Greca L.G., Poskela A., Lehtonen J., Lepikko S., Tardy B.L., Lund P., Subramanian V., J. **Rojas O.J.** Biobased aerogels of different surface charge as electrolyte retaining membranes in a quantum dot-sensitized solar cell, **Cellulose**, 25, 3363–3375 (2018). DOI: 10.1007/s10570-018-1807-2
23. Bai L., Xiang W., Huan S., **Rojas O.J.**, Formulation and stabilization of concentrated edible oil-in-water emulsions based on electrostatic complexes of a food-grade cationic surfactant (ethyl lauroyl arginate) and cellulose nanocrystals, **Biomacromolecules**, 19, 1674-1685 (2018). DOI: 10.1021/acs.biomac.8b00233
24. Kämäräinen T., Ago M., Seitsonen J., Raula J., Kauppinen E.I., Ruokolainen J., **Rojas O.J.** Harmonic analysis of surface instability patterns on colloidal particles, **Soft Matter**, 14, 3387-3396 (2018). DOI: 10.1039/c8sm00383a
25. Cusola, O., Kivistö S., Vierros S., Batys P., Ago M., Tardy B.L., Greca L.G., Roncero M.B., Sammalkorpi M., Rojas OJ., Particulate coatings via evaporation-induced self-assembly of polydisperse colloidal lignin on solid interfaces, **Langmuir**, 34 (20), 5759–5771(2018). DOI: 10.1021/acs.langmuir.8b00650

Peer-reviewed journal publications 2018 (46), cont'd

26. Mattos B.D., Greca L.G., Tardy B.L., Magalhães W.L.E., **Rojas O.J.**, Green Formation of Robust Supraparticles for Cargo Protection and Hazards Control in Natural Environments, **Small**, 1801256 (2018). DOI: 10.1002/smll.201801256
27. Klockars K.W., Tardy B.L, Borghei M., Tripathi A., Greca L.G., **Rojas O.J.**, Effect of anisotropy of cellulose nanocrystal suspensions on stratification, domain structure formation and structural colors, **Biomacromolecules**, 19, 2931–2943 (2018). DOI: 10.1021/acs.biomac.8b00497
28. Hernández J.A., Romero V.H., Escalante A., Toriz G., **Rojas O.J.**, Sulbarán B.C., *Agave tequilana* Bagasse as Source of Cellulose Nanocrystals via Organosolv Treatment, **BioResources** 13, 3603-3614 (2018). DOI: 10.15376/biores.13.2.3603-3614
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1. Xiang W., Tardy B.L., Stubenrauch C., Rojas O.J., “Interfacial Properties of Alkyl Glycosides” in “Bio–Based Surfactants and Detergents: Synthesis, Properties, and Applications", 2nd Ed. (Hayes, Ashby and Solaiman, Eds.) AOCS Press (2019).
2. Huan S., Ago M., Borghei M., Rojas O.J., Nanocelluloses at the Oil–Water Interface: Emulsions Toward Function and Material Development (ch. 16), in "Cellulose Science and Technology: Chemistry, Analysis, and Applications" (T. Rosenau, A. Potthast, Eds.), John Wiley & Sons, Inc. (2019)
3. Salas, C., Hubbe M.A., Rojas O.J., Nanocellulose Applications in Papermaking, in “Production of materials from sustainable biomass resources”, Springer Book Series - Biofuels and Biorefineries (Z. Fang, R.L. Smith, X-f. Tian, Eds.) (2019)
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CONFERENCE and Invited SEMINARS

1. Rojas, O.J., Materials Bioeconomy and Solutions from the Forest, Department of Chemistry, University of Aveiro, December 11, 2018, Aveiro, Portugal.
2. Rojas O.J., Back from the Future with the Forest, Y Science 2018, Slush for Life Sciences, December 5, 2018, Helsinki, Finland.
3. Rojas O.J., Key Enabling Nanotechnologies for the Future Bioeconomy, Department of Chemical Engineering, Nanjing Forestry University, November 14, 2018, Nanjing, China
4. Rojas O.J., Prospects and Utilization of Sustainable Nanomaterials derived from Pulp and Paper Streams, The 5th International Conference on Pulping, Papermaking and Biotechnology, November 12-14, 2018, Nanjing, China
5. Rojas O.J., Nanostructured Materials from Cellulose and Lignin, Department of Chemical Engineering, Dalian Polytechnical University, November 16, 2018, Dalian, China
6. Rojas O.J., Nanocelluloses and Nanolignins in Product Development, Department of Chemical Engineering and Materials Science, Jiangnan University, November 19 and 20, 2018, Wuxi, China
7. Rojas O.J., Biobased polymers: material bank for the development of structure, color and function, Stockholm University, School of Chemistry, June 7, 2018
8. Rojas O.J., Biobased polymers: material bank for the development of structure, color and function, Institute for Advanced Chemistry of Catalonia, Spanish National Research Council, June 26, 2018, Barcelona, Spain.
9. Rojas O.J., Biobased polymers: material bank for the development of structure, color and function, Center for Nano-Integration CENIDE, Universität Duisburg-Essen, August 28, 2018, Essen, Germany
10. Rojas O.J., Biobased polymers: material bank for the development of structure, color and functionJoined Department of Chemistry, Wood Science and Chemical and Biological Engineering, University of British Columbia, September 5, 2018, Vancouver, BC, Canada
11. Rojas O.J., Nanostructured materials from cellulose and lignin, Department of Chemistry, Unicamp, October 25, 2018, Campinas, Brazil

12. Rojas, O.J., Nanostructured materials based on renewable polymers, Brazilian National Nanotechnology Institute, October 26, 2018, Campinas, Brazil
13. Rojas, O.J., Materials Bioeconomy and Solutions from the Forest, Department of Chemical Engineering, University of Waterloo, November 02, 2018, Waterloo, Canada
14. Balakshin M., Capanema E.A., Borghei M., Huang Z., Sulaeva I., Rojas O.J., Feng M., Potthast A., Rosenau T., Recent Achievements in the Valorisation of Technical Lignins, NWBC 2018 - 8th Nordic Wood Biorefinery Conference, Helsinki, Finland, October 23-25, 2018.
15. Rojas, O.J., Lignin Colloids, Properties and Films: Interfacial properties, LiFT workshop - High-Value Products from Lignin, School of Chemical Engineering, Aalto University, August 23-24, Espoo, Finland.
16. Rojas O.J., Biobased polymers: material bank for the development of structure, color and function, 10th Iberoamerican Congress on Pulp and Paper Research (CIADICYP) and 51st. ABTCP of the Brazilian Pulp and Paper Technical Association, São Paulo, Brazil, October 23-25, 2018.
17. Rojas O.J., Key Enabling Technologies (KET) for the future Bioeconomy, Mission 10000 Conference: Nanotechnology: An Enabler for the Bioeconomy, October 17th, 2018, Braga, Portugal
18. Rojas O.J., Nanolignin and nanocellulose: Production and applications in multiphase systems XXIX Interamerican Congress of Chemical Engineering and 68th Canadian Chemical Engineering Conference, CSChE 2018, October 28-31, 2018, Toronto, ON
19. Rojas O.J., Biobased polymers: material bank for the development of structure, color and function, Department of Chemical Engineering, May 31, 2018, Chalmers University, Sweden.
20. Rojas O.J., (Ligno)Cellulose-based nanostructures, characterization, bioapplications and Imaging, Nanomedicines for Biomedical Applications, University of Helsinki, School of Pharmaceutics, May 18, 2018, Helsinki, Finland

21. Balakshin M., Capanema E.A, Rojas O.J., Feng M., The development of efficient methodology for the valorization of technical lignins, 1st PAPTAC International Lignin Conference, Edmonton, Alberta, September 18-20, 2018.
22. Tardy B.L., Lehtonen J., Greca L., Yau N., Mattos B., Beidler J., **Rojas O.J**., Biobased polymers for the development of structure and functions: from bio-fabrication to arts and design, **256th American Chemical Society, Fall National Meeting**, Boston, MA, Aug 19-23, 2018.
23. Huan S., Ajdary R., Klar V., Bai L., **Rojas O.J**.,3D-printable nanocellulose/alginate emulsion gels containing poly(lactic acid), **256th American Chemical Society, Fall National Meeting**, Boston, MA, Aug 19-23, 2018.
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25. Facchine E.G., **Rojas O.J.**, Khan S.A., Shear-induced heterogeneity in flocculating micro/nanofibrillated cellulose microstructures American Physical Society in Los Angeles, CA. March 2018
26. Facchine E.G., Sooah J., Spontak R.J., **Rojas O.J.**, Khan S.A., Liquid crystal ordering transition and colloidal interactions of cellulose nanocrystals, American Physical Society in Los Angeles, CA. March 2018
27. Emily G. Facchine, Sooah Jin, Richard J. Spontak, Orlando J. Rojas, and Saad A. Khan, Understanding self-assembly and ionic strength interactions of cellulose nanocrystals using isothermal titration calorimetry and rheology, **255th American Chemical Society, Spring National Meeting**, New Orleans, LA, March 18-22, 2018.
28. Facchine E.G., **Rojas O.J.**, Khan S.A., Microstructural dynamics and rheology of flocculated micro/nanofibrillated cellulose suspensions, **255th American Chemical Society, Spring National Meeting**, New Orleans, LA, March 18-22, 2018.
29. Facchine E., Rojas O.J., Khan S., Microstructural dynamics and rheology of flocculated micro/nanofibrillated cellulose suspensions, **255th American Chemical Society, Spring National Meeting**, New Orleans, LA, March 18-22, 2018.

30. Abdelgawad A.M., Fritz C., **Rojas O.J.**, Acquiring antibacterial and hemostatic properties forpolypropylene nonwovens via layer-by- layer surface modification using soy bean protein, **255th American Chemical Society, Spring National Meeting**, New Orleans, LA, March 18-22, 2018.
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33. Greca L. G, Lehtonen J., Tardy B.L., Guo J., **Rojas O.J.**, Bacterial cellulose 3D structuring towards new applications, **255th American Chemical Society, Spring National Meeting**, New Orleans, LA, March 18-22, 2018.
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36. Xiang W., Preisig N., Stubenrauch C., Tardy B.L., Laine C., Hjelt T., Tammelin T., Ketoja J., **Rojas O.J.**, Effect of cellulosic fibers on foam dynamics, **255th American Chemical Society, Spring National Meeting**, New Orleans, LA, March 18-22, 2018.
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40. Wang L., Borghei M., Lahtinen P., Papageorgiou A., Lundahl M., Ago M., **Rojas O.J.**, Carbon fibers from nanofibrillated lignocellulose for supercapacitors, **255th American Chemical Society, Spring National Meeting**, New Orleans, LA, March 18-22, 2018.
41. Huan S., Yokota S., Bai L., Ago M., Borghei M., Kondo T., **Rojas O.J.**, Formulation and composition effects in phase transitions of emulsions stabilized by cellulose nanofibrils and an ionic surfactant, **255th American Chemical Society, Spring National Meeting**, New Orleans, LA, March 18-22, 2018.
42. Abbati de A. C., Ago M., Gonzalez R., **Rojas O.J.**, Hasan Jameel, Bio-nanomaterials development: linking R&D activities and industrialization of lignin micro- and nanoparticles, **International Conference on Nanotechnology for Renewable Materials, TappiNano**, Madison, WI, USA, Canada, June 11-14, 2018
43. Greca L., Lehtonen A., Tardy B., Guo J., **Rojas O.J.**, Nanocellulose Biofabrication: A Versatile Toolbox for Self-assembled Functional 3-D Structures, **International Conference on Nanotechnology for Renewable Materials, TappiNano**, Madison, WI, USA, Canada, June 11-14, 2018
44. Huan S., Tardy B.L., Ago M., Lehtonen J., **Rojas O.J.**, engineering the self-assembly of Cellulose nanocrystals on complex topography to obtain advanced hybrid materials, **International Conference on Nanotechnology for Renewable Materials, TappiNano**, Madison, WI, USA, Canada, June 11-14, 2018
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46. Tripathi, A., Khan S., **Rojas O.J.**, Design principles to create porous light-weight materials, **International Conference on**

47. Borghei M., Miettunen K., Greca L.G., Poskela A., Lehtonen J., Lepikko S., Tardy B.L., Lund P., Subramanian V., **O.J**., Biobased aerogels with different surface charge as electrolyte membrane carriers in quantum dot-sensi cell, **22nd Topical ISE Meeting** Tokyo, Japan, April 17th, 2018.
48. Novel avenues to never-dried nanocelluloses for click chemistry approaches, Beaumont M., Khakalo A., **Rojas O.J**., Potthast A., Rosenau T., **15th European Workshop on Lignocellulosics and Pulp**, Aveiro, Portugal, June 26-29, 2018.

Editorial Activities (new in 2018)

- Editor-in-Chief of J. Dispersion Science and Technology (2018-)
- Co-editor of Bioresources and Bioproducts (2018-)
- Editorial board of ACS Sustainable Chemistry & Engineering (2018-)

Index
(click to navigate)

BiCMat
Bio-based Colloids & Materials