



BOOK OF ABSTRACTS



**7th International
Polysaccharide Conference**
11-15 October 2021, Nantes, France



Dear colleagues and friends,

It is our great pleasure and honour to welcome you to the 7th International Polysaccharide Conference that is held in Nantes, France. The conference is the initiative of the European Polysaccharide Network of Excellence (EPNOE) Association in collaboration with the Cellulose Society of Japan and the Cellulose and Renewable Materials Division of the American Chemical Society. The organisers are from five French laboratories recognized for their research in polysaccharides and their commitments to EPNOE.

In the best traditions of the EPNOE Association, the conference is promoting a wide dissemination of research results and cross-fertilization of ideas in the field of polysaccharides. The scientific program is based on the advice of eminent scientists from the scientific committee and proposals of topics from session organisers. The program covers all fundamental and applied research involving polysaccharides, and the venue offers a friendly environment and excellent conditions for networking and exchange of ideas.

We hope that the conference is enjoyable and fruitful, fostering meeting colleagues and friends and building collaborations.

We wish you a very pleasant stay in Nantes.

On behalf of the organising committee:
Bernard Cathala and Johnny Beaugrand (INRAE, France)
Tatiana Budtova (CEMEF/Mines ParisTech, France)
Nicolas Le Moigne (Mines Ales, France)

From EPNOE Association:
Pedro Fardim (KU Leuven, Leuven, Belgium)
Carmen Freire (university of Aveiro, Portugal)

From ACS:
Kevin Edgar (Virginia Tech, USA)

From Cellulose Society of Japan:
Junji Sugiyama (Kyoto University, Japan)

Our special thanks to sponsors who helped to make this conference possible:



Session list

Session number	Session title	Session organizers
1	3D/4D printing of polysaccharide-based solutions, gels and composites	<i>Ryosuke Matsuzaki David Correa</i>
2	Colloidal assembly	<i>Isabelle Capron Wim Thielemens</i>
3	Bioactive polysaccharides	<i>Sylvia Collic-Jouault Odile Francesca Restaino Ariane de Agostini</i>
4	Polysaccharides as natural binders and fillers in construction	<i>Philippe Evon Marc Delgado-Aguilar Mohamed Sonebi</i>
5	Gels and porous materials	<i>Tatiana Budtov Falk Liebner Tsuguyuki Saito</i>
6	Polysaccharides in food processing and digestion	<i>Guy de Della Valle</i>
7	Characterisation of polysaccharides: problems and prospects	<i>Hubert Hettegger Tiina Nypelö Katja Heise</i>
8	Advanced nanocellulose-based materials	<i>Carla Vilela Takuya Kitaoka Anna Roig</i>
9	Polysaccharide-based <i>materials for energy and electronics</i>	<i>Magnus Norgren Sang-Woo Kim</i>
10	Polysaccharides for drug delivery	<i>Carmen Freire Pietro Matricardi Sijtze Buwalda</i>
11	Sustainability and end-of-life assessment of bio-based materials	<i>Avinash Manian Li Shen</i>
12	Natural fibre-reinforced composites	<i>Nicolas Le Moigne Jörg Müssig Tim Huber</i>
13	Chemical and enzymatic modifications of polysaccharides	<i>Jose Kovensky Martin Gericke Kevin Edgar</i>
14	Polysaccharides for bioprinting, scaffolds, and regenerative medicine	<i>Pedro Fardim Tetsuo Kondo Rupert Kargl</i>
15	Polysaccharide solutions and materials from them	<i>Alistair King Thomas Röder Yoshiharu Nishiyama</i>
16	Structure-property relationship of plant cell walls	<i>Alain Bourmaud Darshil U Shah Johnny Beaugrand</i>

KN: keynote lecture 40 min (30 + 10)

O: oral presentation 20 min (15+5)

P: poster presentation

S12-O-02 - BAMBOO FIBERS WITH HIGH LIGNIN CONTENT IN COMPOSITES: INTERFACE AND INTERPHASE STUDIES FIBERS/MATRICE

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To address environmental concerns, lignocellulosic fibers have raised great attention for replacing glass or synthetic fibers in composite applications. In addition to their renewable and biodegradable nature, lignocellulosic fibers have the advantage of being widely available at low price, having low density and interesting mechanical properties, and providing good thermal insulation[1]. Bamboo is the 2nd non-wood plant produced in the world with 30 million tons per year. It grows up mainly in tropical area and most of the bamboo forests (65%) are localized in Asia[2]. Bamboo fiber composites have been extensively investigated in the past decade (Khalil *et al* [3])The nature and the quality of fibers (matrix interactions play a major role in the mechanical performance of the final composite), their understanding and control are primordial for being able to manufacture materials competitive with glass or carbon fiber composites. Bamboo fibers are composed of 40% cellulose, 30% hemicelluloses, 30% lignin, pectin, waxes and others extractibles. In this study, we propose to take advantage of the high lignin content (i) to enhance the compatibilization between bamboo fibers and non-polar matrices, such as epoxy resin or thermoplastic polymer; or (ii) to form self-bonded 100% bamboo fibers materials by pressing and localized heating generated by ultrasonic welding. After a soft alkali treatment of bamboo strips to individualize fibers and to increase the surface fiber roughness, mat fibers were prepared by classical hand sheet paper making[4]. Composites were prepared by infusion with a thermoset resin, by hot-pressing with a thermoplastic polymer or by ultrasonic welding (without any binder)[5]. Matrices and fiber interface and interphase were analyzed by SEM, and AFM in QNM mode. The adhesion was analyzed by pull-out tests and by AFM approach-retract curves between a colloidal probe and the fiber at the nanoscale. Then, results were compared with the macroscale mechanical behavior and discussed.

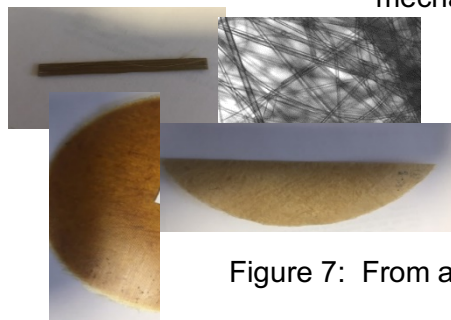


Figure 7: From a strip to a composite

[1] S. K. Ramamoorthy, M. Skrifvars, et A. Persson, « A Review of Natural Fibers Used in Biocomposites: Plant, Animal and Regenerated Cellulose Fibers », *Polymer Reviews*, vol. 55, n° 1, p. 107-162, janv. 2015, doi: 10.1080/15583724.2014.971124.

[2] M. Jawaid, S. Mavinkere Rangappa, et S. Siengchin, Éd., *Bamboo Fiber Composites: Processing, Properties and Applications*. Singapore: Springer Singapore, 2021.

[3] H. P. S. Abdul Khalil, I. U. H. Bhat, M. Jawaid, A. Zaidon, D. Hermawan, et Y. S. Hadi, « Bamboo fibre reinforced biocomposites: A review », *Materials & Design*, vol. 42, p. 353-368, déc. 2012, doi: 10.1016/j.matdes.2012.06.015.

[4] M. Das et D. Chakraborty, « Evaluation of improvement of physical and mechanical properties of bamboo fibers due to alkali treatment », *J. Appl. Polym. Sci.*, vol. 107, n° 1, p. 522-527, janv. 2008, doi: 10.1002/app.26155.

[5] A. Regazzi *et al.*, « Microstructural and mechanical properties of biocomposites made of native starch granules and wood fibers », *Composites Science and Technology*, vol. 182, p. 107755, sept. 2019, doi: 10.1016/j.compscitech.2019.107755.



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