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“It is important to join forces to stimulate the commercial use of lignin in sustainable products”

Who are we

By the Action chair Richard Gosselink

In this third Newsletter from the LignoCOST network (CA17128 - Establishment of a Pan-European Network on the Sustainable Valorisation of Lignin) we will describe who we are, what our aim is and which progress we made.

Lignin is removed during paper making and is released in the production of cellulosic ethanol. Currently, the base case for lignin is to use it simply as an internal energy source in the pulping and biorefinery industries. However, the industry is more and more convinced that economic valorization of this aromatic side stream is absolutely essential to make the processing of lignocellulosic feedstocks market competitive. In addition to those processes that consider lignin a side stream, much attention is nowadays given to the development of biorefineries, in which, next to cellulose, lignin actually is one of the main, high-value intermediate product streams to be further processed into a portfolio of biobased products, materials and secondary energy carriers.

To unlock the potential of lignin, an interdisciplinary and cross sectorial approach is needed by grouping relevant expertises within one pan-European network to tackle and overcome the challenges faced in industrial lignin valorization. **This fulfills our aim to stimulate the industrial application of lignin.**

LignoCOST brings together partners with outstanding and complementary expertises, active over the whole lignin value chain from production to applications. With over **330 participants** from 36 European countries, 4 Near Neighbour Countries and 4 International Partner Countries a **very strong network** has been created. More than **26 industrial companies** are represented in LignoCOST.

Working groups

LignoCOST has been organised via the following working groups:

WG1 WikiLignin, tool for lignin information (Bernard Kurek, INRAE, FR, bernard.kurek@inrae.fr)

The purpose of WG1 is to develop a database comprising lignin sources, availability, properties and repository of state-of-the-art analytical methodologies and turn key methods for industry.

WG2 Production and catalytic conversion technologies, including Technology Readiness Level (Pieter Bruijnincx, UU, NL, P.C.A.Bruijnincx@uu.nl).

The focus of WG 2 is on bio- and chemo-catalytic conversion technologies including technology readiness level (TRL) assessment of ligno cellulosic raw material.

WG3 Industrial application requirements versus lignin properties (Karolien Vanbroekhoven, VITO, B, karolien.vanbroekhoven@vito.be)

The focus of WG3 is on industrial application requirements (market demand) versus lignin properties (supply). Bringing these two topics together will result in viable industrial opportunities for lignin application.

WG4 Development of value chains for lignin valorisation (Per Tomani, RISE, SE, per.tomani@ri.se).

The focus of WG4 is to create industrial viable opportunities for lignin valorisation by identifying industrial chains from supplier to end user. Development of value chains for lignin valorization.

WG5 Technical and full sustainability aspects, LCA, market deployment, potential and implementation (Apostolis Koutinas, AUA, GR, akoutinas@aua.gr).

Life cycle analysis is an important tool for evaluating the opportunities for the implementation of lignin in industrial processes. WG5 will evaluate the LCA's for the most promising opportunities.

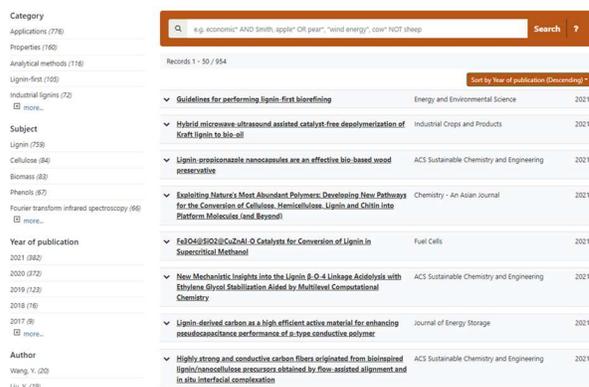
“LignoCOST is formed by stakeholders from the whole value chain, including companies, RTOs and universities”

CA 17128 LignoCOST will run from 03/10/2018 – 03/04/2023

Results & Achievements

By working group leaders

WG1 has prepared a Wiki-LIGNIN data base which is filled with more than 2898 papers (at 01/10/2022) and classified according to 7 categories into a simple-to-use web interface. During the August 24-25 meeting in Tallinn (Estonia), the improvements of this web-tool, through the aggregation all the newest information on lignin structures, properties, characterization techniques and applications was discussed. To reach the WG1 deliverables, it was proposed to create an open access electronic knowledge book coupled to the wiki lignin data base, based on the model used within the Zelcor project (<https://plasticapps.transform.inrae.fr/zelcor/navig.php?idoc=1024&start=yes>). The book will be developed at INRAE Reims, in collaboration with WUR, by a post-doctoral scientist who will exploit the wiki lignin database and mobilize all the expertises present within the LignoCOST network. A focus will be done on new applications and new methods that can be identified within the Wiki LIGNIN database.



Joint paper: Oihana Gordobil, Huisi Li, Ana Ayerdi Izquierdo, Ainhoa Egizabal, Olena Sevastyanova, Anna Sandak, “Surface chemistry and bioactivity of colloidal particles from industrial kraft lignins”, International Journal of Biological Macromolecules 220 (2022) 1444–1453

<https://doi.org/10.1016/j.ijbiomac.2022.09.111>

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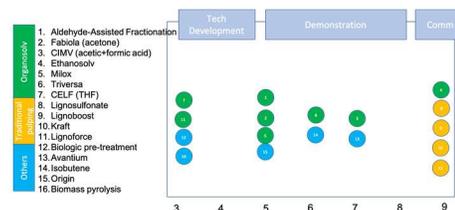
(Slovenia, Brazil, Portugal)

LignoCOST outreach to academia, industry and public



Harmonization has to be done with WG2 and WG3 working on selected value chains for lignin. These two information notes and deliverable report should be delivered to LignoCOST consortium in March 2023.

WG2 has been working on gathering information on the various upstream technologies for lignocellulose processing and lignin isolation as well as on the various, general catalysis strategies under development that further convert the isolated lignin into valuable products. A more detailed overview was prepared to review the different processes taken into account the different TRLs:



Results & Achievements

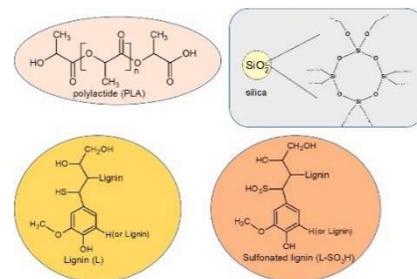
By working group leaders

WG3 is working on finalizing the first deliverable, i.e., an inventory of relevant applications where lignin or lignin derivatives can replace fossil-based compounds. Therefore 7 different applications have been selected, namely: resins, marine fuels, flavours and fragrances, polymeric blends, asphalt, and adsorbents. For all these applications detailed fact sheets have been prepared. Then, comparison with properties of available lignin sources and derivatives in relation to the application requirements will be made. Missing information will be used for defining research.

WG4 The first value chain we started to cover is lignin phenol formaldehyde (LPF) resin applications. We have used this value chain to create a template for all selected value chains. The documentation focus on the commercialisation potential of LPF resins in wood based panels. The other value chains are aligned with the applications selected in WG3. For those value chains the collection of data has been started and will be finalised in the coming months. For the LPF resin value chain, various companies were interviewed to give feedback on the gathered information. To continue the work in WG4 dedicated online workshops will be organised for each value chain.

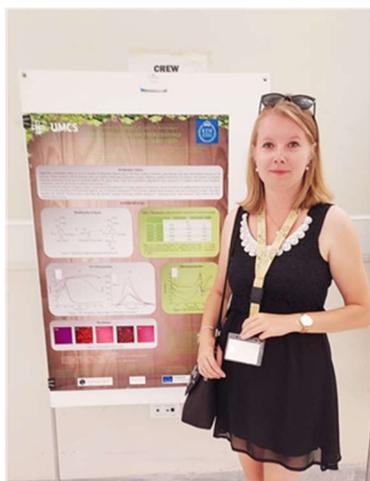
WG5 will support the most promising lignin valorisation value chains via sustainability evaluation including profitability and environmental impact assessment. Within this grant period, WG5 focused on developing inventories for mass and energy balances for promising value chains of lignin valorisation (e.g. LPF resins, aromatics from lignin). Continuation of the collaboration between WG5 (LignoCOST) with ENEA, Aristotle University of Thessaloniki, University of Lund and University of Salerno within the IEA Bioenergy Task 42 “Biorefining in a future BioEconomy” towards process superstructure development. Preliminary techno-economic and life cycle assessment of the selected lignin-based value chains will be performed and focus will be given to the preparation of the WG5 deliverables.

Joint paper: Beata Podkoscielna, Mateusz Gargol, Marta Goliszek, Tomasz Klepka, Olena Sevastyanova, Degradation and flammability of bioplastics based on PLA and lignin, Polymer Testing 111 (2022) 107622, <https://doi.org/10.1016/j.polymertesting.2022.107622> (Poland, Sweden)



Group photo of participants attending the LignoCOST Lignin conference + trainings day May 31 – June 3, 2022 (Wageningen, The Netherlands)

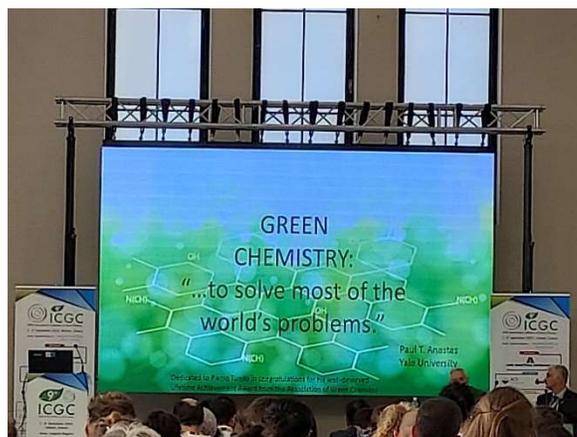
ITC Conference Grant



Dr Marta Goliszek was awarded a grant for the participation in the 9th IUPAC International Conference on Green Chemistry (9th ICGC) in Athens (5th-9th September 2022).

The IUPAC ICGC conference offered the opportunity to discuss the latest developments in green and sustainable chemistry, to expand existing and establish new relations among academia and industry, and to disseminate the philosophy and principles of sustainable development and circular (bio)economy.

“During the session regarding *Valorization of renewable and natural resources* topic I presented my poster presentation about synthesis and characterization of lignin-containing polymer coatings. The participation in this conference gave me the possibility of taking part in many valuable scientific discussions connected with exchange of thoughts with leaders in the field of green and sustainable chemistry.”



ITC Conference Grants

Inclusiveness Target Countries (ITC) Conference Grants aim at supporting PhD students and ECI researchers from participating ITCs, to attend international (preferably European) conferences related to the objectives of our Action, with a poster or oral presentation. Two ITC conference grants have been awarded up to now and more grants will be available in the coming periods.

*The following countries are considered as ITC: Bosnia-Herzegovina, Bulgaria, Cyprus, Czech Republic, Estonia, Croatia, Hungary, Lithuania, Latvia, Luxembourg, Malta, Montenegro, Poland, Portugal, Romania, Slovenia, Slovakia, FYR Macedonia, Republic of Serbia



ITC Conference Grant

Dissemination & Communication

By the Science Communication Manager (Konstantinos Triantafyllidis, AUTH, GR, ktrianta@chem.auth.gr)

LignoCOST aims to coordinate and combine multidisciplinary knowledge and expertise and deliver high quality research and technological output. Joint reports and publications from different countries and groups is one of the primary objectives of the Action. More than twenty joint publications and conference presentations have taken place (<https://lignocost.eu/dissemination/>).

Communication of our activities to a wider spectrum of industry and potential markets, as well as towards the broader public, across the borders of Europe, aims to increase the awareness and acceptance of lignin and waste biomass derived fuels, chemicals and materials (<https://lignocost.eu/communication/>).

STSMs

By the Grant Awarding Coordinator (Filomena Barreiro, IPB, PT, barreiro@ipb.pt)

STSM is the acronym for **Short Term Scientific Missions**. This tool within the COST action allows researchers to visit other labs within the EU for a short stay of several weeks to a longer stay of 3 – 6 months. The STSM coordinator in this COST action is Filomena Barreiro. Please contact her when you have questions regarding this program and how to apply. Up to now 38 STSMs have been awarded with this grant (<https://lignocost.eu/stsm/>). Also for the current grant period GP5, starting at 1 November 2022 – 3 April 2023, again several STSM grants will be available. **Please take note when the announcement is made.**

Organised events in 2022

4th MC meeting, 20 January, 2022 (ONLINE)

Lignin conference + trainings day 'Lignin analytics', Wageningen (NL), May 31-June 3, 2022

Trainingschool, Turku (FI), June 20-23, 2022

Working group meetings, Tallinn (EE), August 24-25, 2022

Coming networking activities

6th MC meeting, 24 November, 2022 (ONLINE)

Working group meetings, Reims (FR), 1-2 February, 2023

Final dissemination conference, Pisa (IT), 2-3 March, 2023

Final MC meeting, 15 March, 2023 (ONLINE)

General Information

For more information please consult our website

www.lignocost.eu

Social media:

Facebook > <https://www.facebook.com/lignocost/>

LinkedIn > <https://www.linkedin.com/company/lignocost>

Twitter > <https://twitter.com/lignocost>

Persons interesting in lignin valorisation, please contact us to join this International pan-European network.

CA17128 LignoCOST is a networking Action, supported by COST, to stimulate and financially contribute to the organisation of short term scientific missions between partner institutions, networking events, workshops, and training schools. No support is available to perform research & development activities.



Group photo participants at the Working group meetings, Tallinn (EE), August 24-25, 2022

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COST description

COST (European Cooperation in Science and Technology) is a funding agency for research and innovation networks. Our Actions help connect research initiatives across Europe and enable scientists to grow their ideas by sharing them with their peers. This boosts their research, career and innovation.

www.cost.eu



Funded by the Horizon 2020 Framework Programme of the European Union