Integrating sustainability and health in buildings through renewable materials

InnoRenew CoE International Conference
2020

InnoRenew CoE
Livade 6, 6310 Izola, Slovenia

INNORENEW.EU

InnoRenew CoE is funded by the European Commission under Horizon 2020, the EU Framework Programme for Research and Innovation (H2020 WIDESPREAD-2-Teaming #739574), and by investment funding from the Republic of Slovenia and the European Regional Development Fund.

EVROPSKA UNIJA
EVROPSKI SKLAD ZA REGIONALNI RAZVOJ

Welcome

As we open the second InnoRenew CoE International Conference, it's hard not to think of all that has changed in the year and a half that has passed since our debut conference.

Although the pandemic has dramatically changed our day-to-day lives, it has not changed society's need to address the rapidly changing climate, reconsider our economic priorities, and refocus our attention on important social issues. Buildings remain part of the solution to many problems, and I think it is becoming clear that we need to consider much more about buildings than the basics of shelter.

As the pandemic kept us indoors, many of us may have realised that our indoor environment plays an even more important role in our well-being and happiness than we previously acknowledged. Likewise, we may have considered more carefully how buildings affect the well-being of those who live in different circumstances. Access to safe, comfortable, and healthy living and working spaces is (and should be) a priority in a just society.

Another major change that will affect our work in the years to come is the introduction of the European Green Deal, which will be a major driver of sustainable development in Europe. The European Green Deal prioritises investment and innovation in building renovation solutions for energy performance and attempts to ensure these solutions reach all members of society. The European Green Deal recognizes the need to establish high-performance housing for all and will support renovation in social housing, schools, and other facilities that are often left behind. This is a step in the right direction for inclusive, high-performing buildings.

I rarely find proclamations of success convincing when it comes to sustainability – especially about buildings. We must continue to drive change through research, development, and innovation to make our built environment a beacon of sustainable development. We cannot be satisfied with the environmental performance of our products or buildings; we cannot allow people to be excluded from our advancements; and we cannot forget that buildings impact the well-being and happiness of their occupants.

At this year's InnoRenew CoE International Conference, we wanted to showcase how renewable materials play an integral role in sustainable construction by highlighting environmental performance, safety, and health as well as the economic, digital, and social links that bind us to the materials in the built environment. Conference presenters will discuss advances in design, material development, health research, retrofitting, environmental assessment, and many other topics that increase the efficiency and performance of the building and renewable materials sectors.

Carlo Battisti, President of Living Future Europe, will weave together these complementary threads in his keynote address, "Healthy, living transparent. The quiet revolution of materials". He works to push for change and supports researchers, architects, engineers, and other construction professionals to achieve it. His efforts have expanded knowledge and acceptance of restorative sustainability and regenerative design within Europe's construction community. We are excited and grateful for his participation in our conference.

Together, the contributions paint a hopeful picture. But we must continue to push the science forward, embed these innovations in normal construction practices, and ensure inclusion of all who can benefit from our hard work.

While I wish these matters could have been discussed in person in Izola, we must embrace new options for discourse on these topics. I hope the conference inspires you to reach out to one another and continue sharing, collaborating, and building communities that embrace the challenge of creating a sustainable and just built environment. You may also consider our new open access and peer-reviewed journal, *Interdisciplinary Perspectives on the Built Environment*, as a place to share the insights your work provides.

Thank you,

Dr Michael Burnard
Deputy Director, InnoRenew CoE
Assist. Prof., University of Primorska

Schedule at a Glance

MORNING

Welcome
9:00–9:05

Keynote
9:05–9:35

Flash Talks
9:35–10:35

Coffee Break
10:35–11:00

Human Health in the Built Environment
11:00–12:30

Lunch
12:30–14:00

AFTERNOON

Complementary Topics
14:00–15:30

Coffee Break
15:30–15:55

Sustainable Construction with Renewable Materials
15:55–17:25

Closing
17:25–17:30

Keynote Address

Carlo Battisti
President, Living Future Europe

Healthy, living, transparent.
The quiet revolution of materials.

Carlo Battisti has a degree in civil engineering from the Politecnico of Milan, nearly twenty years of experience in construction companies and a master's in management and organizational development from MIP International Business School. His certifications include Certified Project Manager IPMA®; LEED®, Living Future and WELL Accredited Professional; GBC Home AP, GBC Historic Building AP; USGBC® and WELL Faculty™.

Since 2009, he has been working with IDM South Tyrol (Italy) as an innovation manager in the Business Development department, Construction. From 2010 to 2011, he worked with the Energy and Environment Cluster of Trentino as manager of the business unit for sustainable products. From 2015 to 2016, he was the co-owner of a startup focused on LEED consulting. In 2015, he co-founded the Living Future Italy Collaborative.

Since 2017, he has been working with Eurac Research as Chair and Project Manager of COST Action 16114 RESTORE (REthinking Sustainability TOwards a Regenerative Economy). The RESTORE COST Action (2017-2021) will affect a paradigm shift towards restorative sustainability for new and existing buildings and space design across Europe through the collaboration of 160+ researchers from 40 European countries.

Since 2018, he is European Executive Director for the International Living Future Institute and current President of Living Future Europe. The Institute's mission will hasten the change and provide needed direction towards a regenerative design transition in Europe. It is actively pursuing European market alignment and adaptations of the Living Building Challenge (LBC).

Agenda

Welcome | 9:00-9:05
Dr Michael Burnard, InnoRenew CoE

Keynote | 9:05-9:35
Carlo Battisti, Living Future Europe

Flash Talks | 9:35-10:35

Coffee Break | 10:35-11:00

*Unable to present

Human Health in the Built Environment | 11:00-12:30

Lunch | 12:30-14:00

Complementary Topics | 14:00-15:30

Coffee Break | 15:30-15:55

IRIC2020 AGENDA CONTINUES ON THE NEXT PAGE

Agenda

Sustainable Construction with Renewable Materials | 15:55-17:25

Closing | 17:25-17:30

THANK YOU FOR ATTENDING IRIC2020!

SEE YOU NEXT YEAR
HTTPS://INNORENEW.EU/IRIC2021

Flash Talks

Improving hydrophobicity and thermal stability of wood by esterification with fatty acids

René Herrera[1,2], Oihana Gordobil[1], Pedro Luis de Hoyos Martinez[1,3], Jakub Sandak[2,4], Anna Sandak[2,5]

1 Chemical and Environmental Engineering Department, University of the Basque Country (UPV/EHU), rene.herdiaz@innorenew.eu ; renealexander.herrera@ehu.eus ; ogordobilo02@gmail.com ; pedrolu-is.dehoyos@ehu.eus
2 InnoRenew CoE, jakub.sandak@innorenew.eu ; anna.sandak@innorenew.eu
3 University of Pau and Pays de l'Adour
4 University of Primorska, Andrej Marusic Institute
5 University of Primorska, Faculty of Mathematics, Natural Sciences and Information Technologies

The hydrophilic nature of wood is based on its structural anisotropy and strong affinity to hydroxyl functional groups (mainly due to the polysaccharides present in its structure), making wood very reactive with water. The environmental factors can cause instability to the wood matrix and its deterioration; thus, several wood modification techniques have been developed to ensure its long-term durability and focus on specific applications (Gérardin, 2016). The natural fats are an interesting alternative for wood protection when converting them into fatty acid chlorides (Jebrane and Sebe, 2008). Acid chlorides containing long hydrophobic chains can provide a water-repellent effect and thermal stability when reacting with the wood matrix (Hon, 2017). In this study, samples of Monterey Pine (*Pinus radiata*) were used for the esterification process; firstly, by removing its polar extractives (toluene:ethanol (2:1) extraction), then, kept under vacuum atmosphere to improve the esterification. Three different reagent were used for modification process: hexanoyl chloride (C6), lauroyl chloride (C12) and steaoryl chloride (C18) at [0.1M; 0.5M; 1M]. Pyridine (10%) was used as a catalyst, and the byproducts of the reaction were removed by adding triethylamine. The reaction was conducted for 3h at 100ºC (C6, C12) or at 80ºC (C18). Finally, the modified wood was washed with dietylether and ethanol. After modification, the WPG and density were increased proportionally to the reactive concentration [0.1M to 1 M]. The hydrophobicity and surface energy were changed, with a higher hydrophobic behaviour after the esterification reactions. Moreover, a thermal analysis (carried out by TGA under an oxidative environment) to emulate the typical conditions of a fire combustion was performed, confirming that the resistance to thermal degradation at higher temperatures (above 500ºC) increased. It was particularly enhanced by the esterification treatments with short alkyl chain.

Keywords: wood modification, esterification process, fatty acids, hydrophobicity, thermal resistance

Acknowledgements: First Author gratefully acknowledges receiving funding from the Department of Education of the Basque Government (post-doctoral grant POS-2018-1-0077). The authors gratefully acknowledge the European Commission for funding the InnoRenew project (Grant Agreement #739574) under the H2020 Widespread-Teaming programme and the Repub-lic of Slovenia for funds from the European Regional Development Fund.

REFERENCES

Gérardin, P. 2016. New alternatives for wood preservation based on thermal and chemical modification of wood—a review. Ann. For. Sci.73(3), 559-570. https://doi.org/10.1007/s13595-015-0531-4

Hon, D.S. 2017. Chemical modification of lignocellulosic materials, 1st ed. Routledge, New York. https://doi.org/10.1201/9781315139142

Jebrane, M; Sebe, G.A. 2008. New process for the esterification of wood by reaction with vinyl esters. Carbohydr 72(4), 657-663. https://doi.org/10.1016/j.carbpol.2007.10.001

2020

CONFERENCE SPONSOR

VG5

INNORENEW PROJECT PARTNERS

Fraunhofer WKI

Univerza v Mariboru

Zavod za varstvo kulturne dediščine Slovenije
Institute for the Protection of Cultural Heritage of Slovenia

ZAG

Inštitut za celulozo in papir
Pulp and paper Institute

Bogišićeva ul. 8, 1000 Ljubljana
tel.: +386 1 200 28 00
fax.: +386 1 426 56 39
email: info@icp-lj.si

NIJZ Nacionalni inštitut za javno zdravje

RRA LUR

InnoRenew CoE is funded by the European Commission under Horizon 2020, the EU Framework Programme for Research and Innovation (H2020 WIDESPREAD-2-Teaming #739574), and by investment funding from the Republic of Slovenia and the European Regional Development Fund.

The InnoRenew CoE International Conference 2021

HEALTHY AND SUSTAINABLE RENOVATION WITH RENEWABLE MATERIALS

June 10-11 | Izola, Slovenia

2021

JOIN US AGAIN NEXT YEAR

HTTPS://INNORENEW.EU/IRIC2021 | #IRIC2021

EVROPSKA UNI
EVROPSKI SKLAD ZA REGIONALNI RAZVOJ

InnoRenew CoE is funded by the European Commission under Horizon 2020, the EU Framework Programme for Research and Innovation (H2020 WIDESPREAD-2-Teaming #739574), and investment funding from the Republic of Slovenia and the European Regional Development Fund.