

Dansk Bioøkonomi Konference
International temadag (in English)
Building Based on Bio Based - BBoBB
October 2nd 2024 – CELF, Merkurs Plads 1, 4800 Nykøbing Falster.

Interreg
North Sea



Co-funded by
the European Union

BBoBB

BBoBB status for bio binders in North Sea Region

Lahcen Kouchaf, IMT Nord Europe, France.



IMT Nord Europe
École Mines-Télécom
IMT-Université de Lille



Participants of BBoBB project

- Province of Fryslân, The Netherlands
- House of Design, The Netherlands
- Biosintrum, The Netherlands
- Circulair Friesland, The Netherlands
- Kompetenzzentrum 3N, Germany
- Jade Hochschule, Germany
- Heidekreis, Germany
- Guldborgsund Kommune, Denmark

- Business Lolland-Falster, Denmark
- Agrovi, Denmark
- CELF, Denmark
- Design Regio Kortrijk VZW, Belgium
- University Gent, Belgium
- IMT Nord Europe, France
- CEREMA, France
- GECCO, France





IMT Nord Europe
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IMT Nord Europe is a French Graduate School of Engineering affiliated to the Institut MinesTélécom and a partner of the University of Lille. IMT Nord Europe is a major research and education player in today's energy, ecological, digital and industrial transitions.

L. Khouchaf, Walid Maherzi, F. Béquart



Cerema, a public establishment reporting to the Ministry of Ecological Transition and Territorial Cohesion, supports the State and local authorities in the development, deployment and evaluation of public planning and transport policies.

A. Ben Fraj, V. Mouillet, C. Some, H. Beddaa.



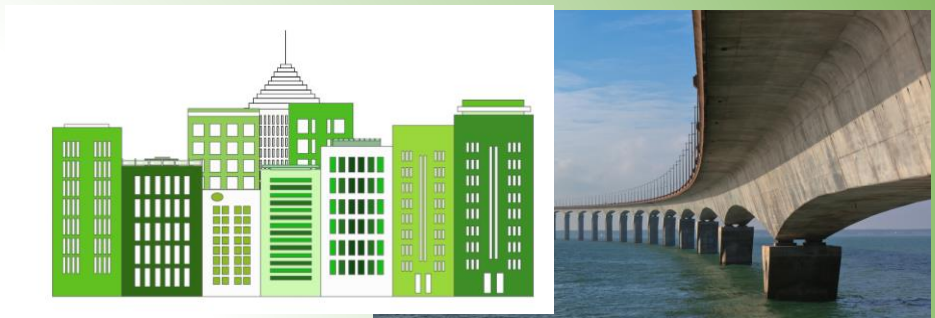
GECCO Social and Solidarity company created in 2007, expert in the collection and recovery of used food oils and bio-waste. We collect used cooking oils and bio-waste from catering professionals. We collect cooking oils generated by individuals, via voluntary drop-off points set up in recycling centers and partner stores.

S. Duman, M. Millares



Who doesn't like living in a green building?

Who doesn't like parking or driving on a green road?



civil engineering construction



Roadways, pavement

Emissions of particulate matters, volatile organic compounds and polycyclic aromatic hydrocarbons from warm and hot asphalt mixes



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LABEL

**BÂTIMENT
BIOSOURCÉ**



In France, the State label « Bâtiment biosourcé » was created in 2012 to promote the use of bio-based materials in new construction. It was updated in 2024 by decree of July 2, 2024.

Link to the decree of July 2, 2024 : <https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000049880757>

The CESER Hauts-de-France has adopted its recommendations entitled “promoting the structuring and development of sectors of bio based products and materials in Hauts-de-France”.



Bio-based Circular Economy Good Practices in France

Valorizing green waste

Valorizing eco construction

Reducing bio-waste from domestic waste

Developing new bio asphalt formulation

Biomethane from anaerobic digestion of agricultural wastes

Farm carbon footprint reduction through fermentable waste valorization by anaerobic digestion



CESER
Hauts-de-France

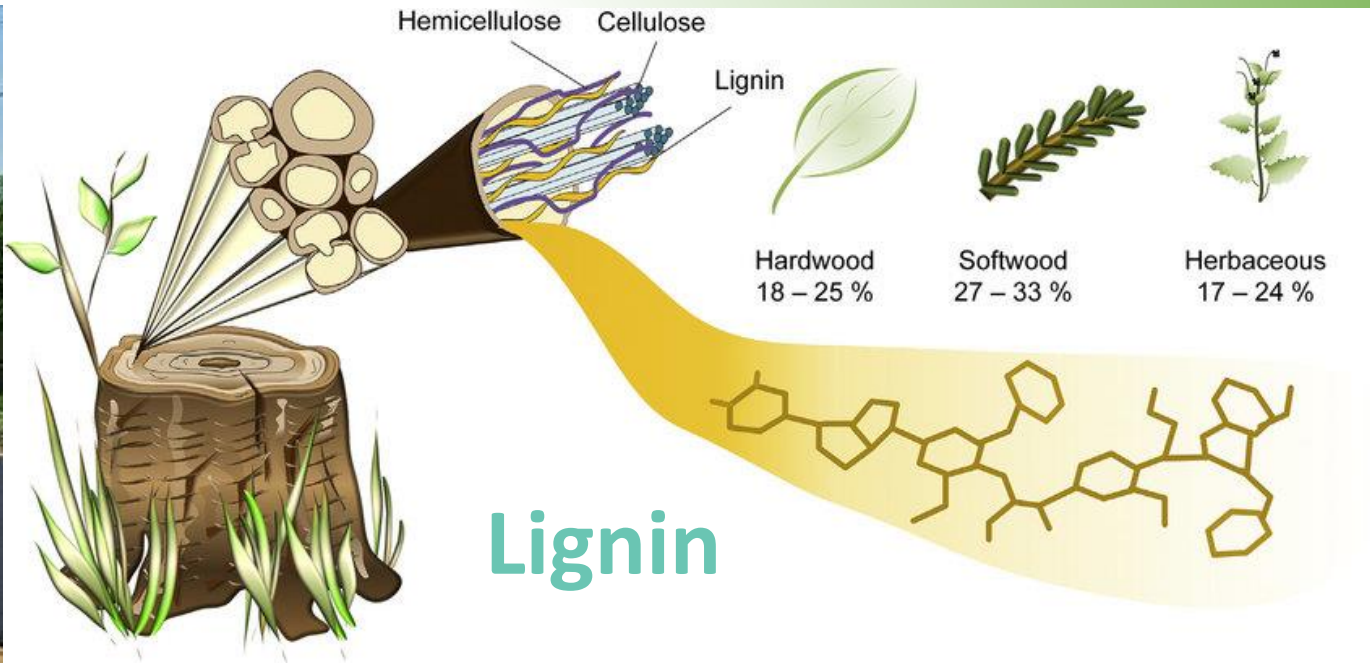
Conseil Économique, Social
et Environnemental Régional

To promote the application of bio-materials and provide development, we need further researches, and new solutions :

BBoBB project is the good place!



(Gecco)



Bio binders are gaining prominence as sustainable alternatives to traditional petroleum-based asphalt.

Bio binder : The product of bio-oil processed by distillation, extraction oxidation and polymer modification.

Modifier, diluent or substitute;



Bio-oils : a mixture obtained from different biomasses through pyrolysis, alcoholysis, acidolysis, high liquefaction, etc.,

include wood fiber type, waste oil type and animal manure type.

Lignin: : Lignin is one of the main components of wood, along with cellulose and hemicellulose: it is the second most abundant renewable biopolymer on Earth, after cellulose. Together, they account for more than 70% of total biomass.

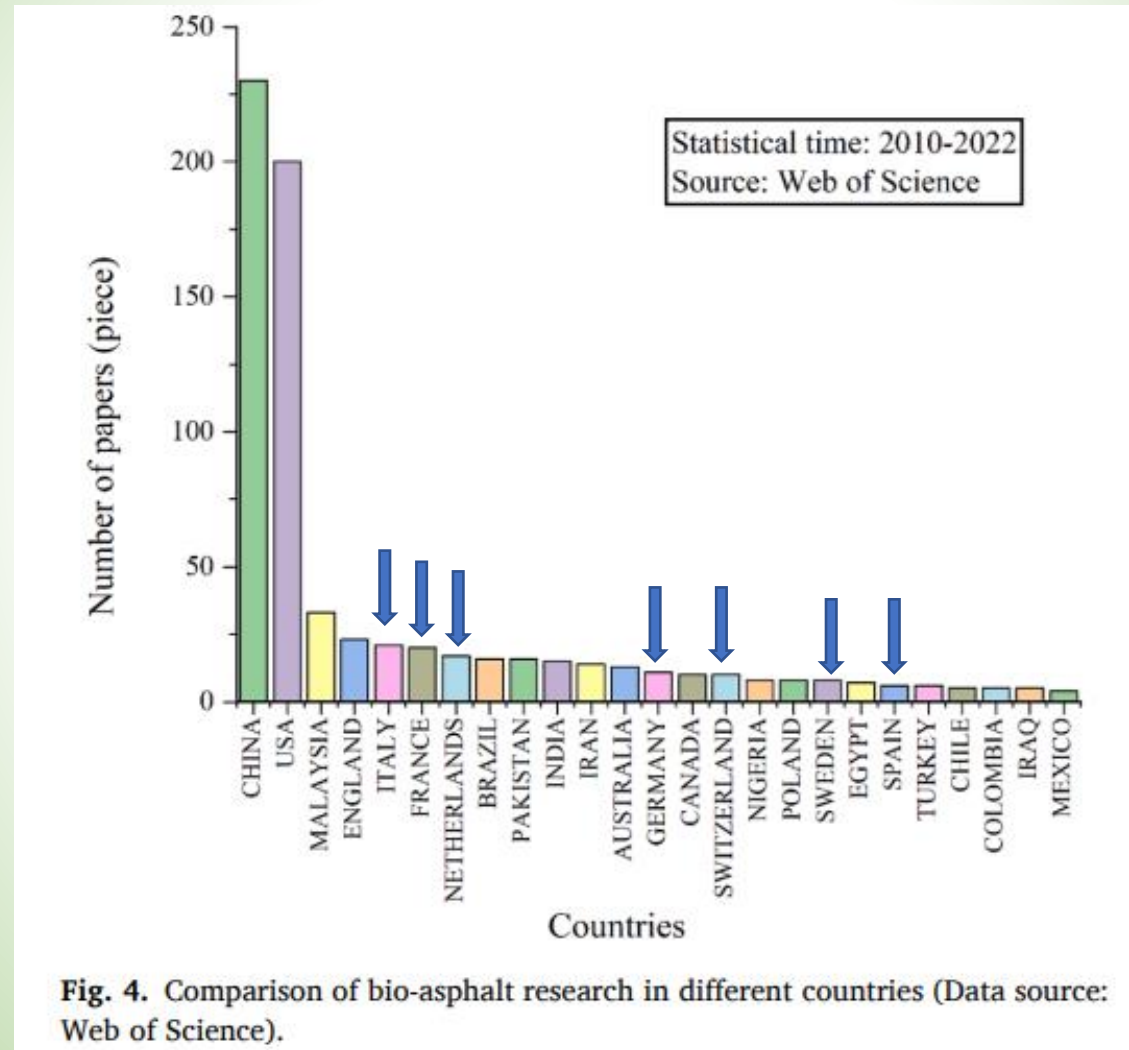


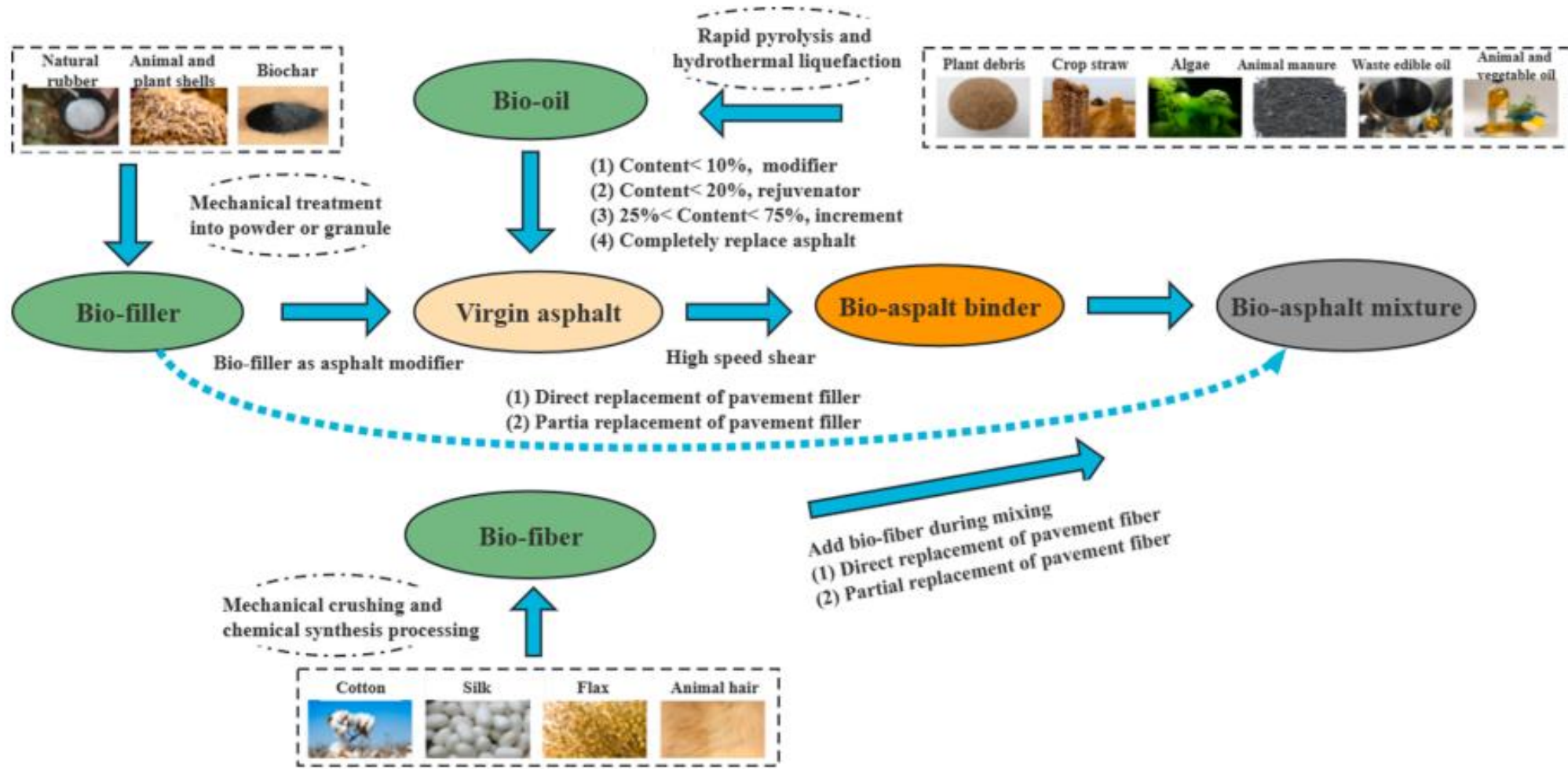
- Choice of materials and bio based materials
- Production process
- Choice of analysis and characterization techniques
- Carrying out the tests on Bio Asphalt, and Bio Concrete
- Environmental Impact Assessment Protocol
- Search for companies and partners in the region.



More than 12 million tons of fossil-based products and about 2 billion tons of natural aggregates are consumed every year in the EU.

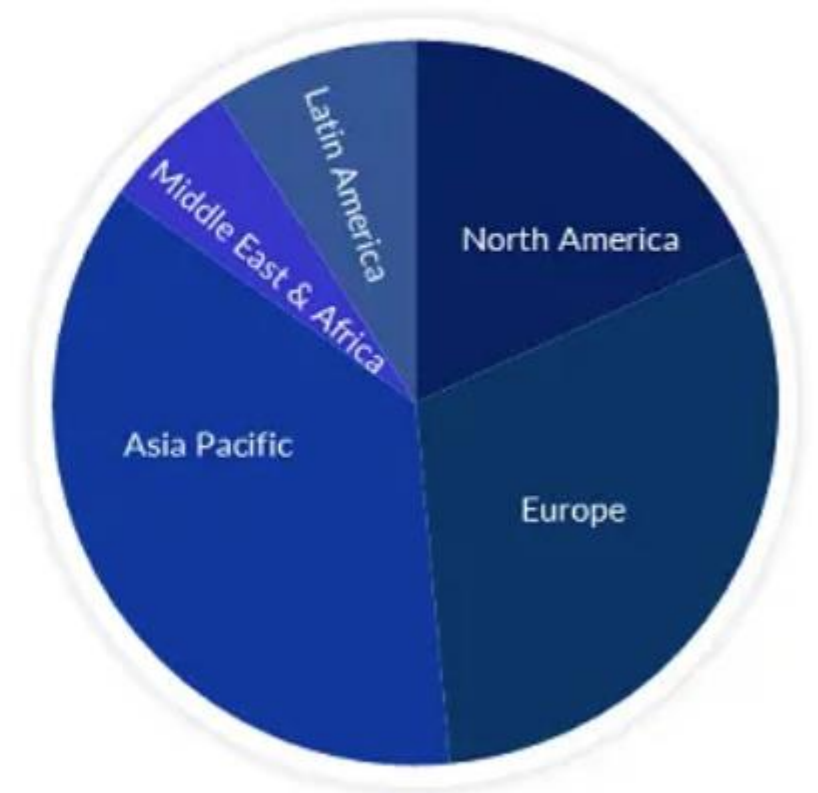
EUROPEAN ASPHALT PAVEMENT ASSOCIATION. EAPA—Asphalt in Figures 2020. Available online: https://096.wpcdnnode.com/eapa.org/wp-content/uploads/2021/12/asphalt_in_figures_2020.pdf .





(a) Application method and classification of pavement biomass materials.

Global Lignin Market Share (in %), Segmented by Region, 2036



Lignin Market: Key Insights

Base Year	2023
Forecast Year	2024-2036
CAGR	4.2%
Base Year Market Size (2023)	USD 825.26 Million
Forecast Year Market Size (2036)	USD 1.4 Billion
Regional Scope	<ul style="list-style-type: none">• North America (U.S., and Canada)• Latin America (Mexico, Argentina, Rest of Latin America)• Asia-Pacific (Japan, China, India, Indonesia, Malaysia, Australia, Rest of Asia-Pacific)• Europe (U.K., Germany, France, Italy, Spain, Russia, NORDIC, Rest of Europe)• Middle East and Africa (Israel, GCC North Africa, South Africa, Rest of the Middle East and Africa)

News / 08/12/2020

Lignin replaces bitumen in all layers

Bio-asphalt road in Vlissingen put into use



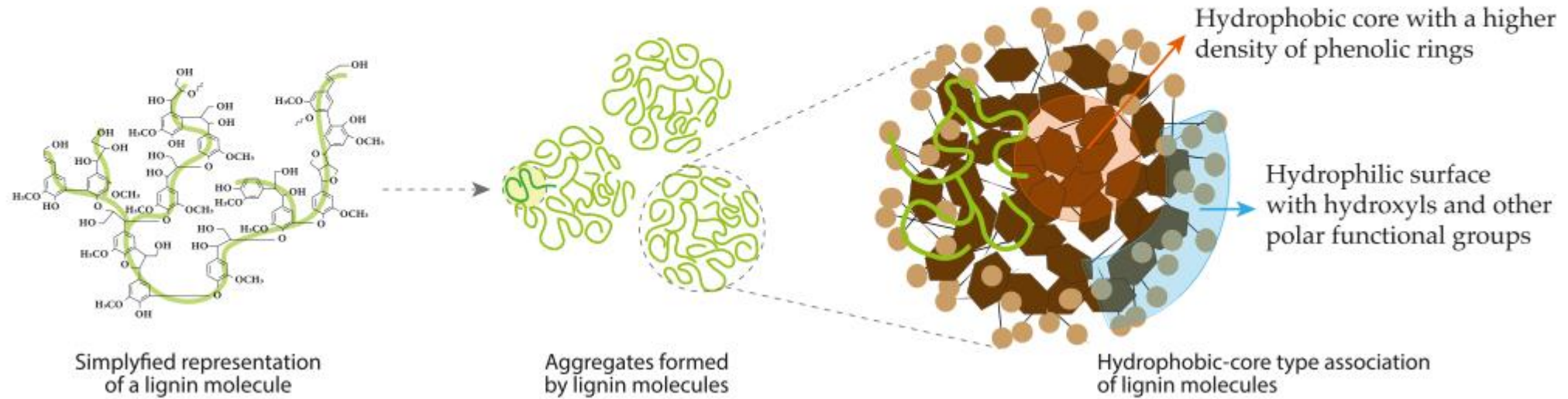
No Comments



Commissioned by North Sea Port, contractor H4A has constructed a sustainable road in Vlissingen of which the bottom layer, the intermediate layer and the top layer all consist of biobased asphalt.

Editorial office / Vlissingen

Technical lignins such as Soda, Alkali, Kraft, Lignosulfonates, CAN SELF-ASSEMBLE:



Nynas and Shell in Hanson UK bio-binder trial

Hanson UK is using Nynas's biogenic binder Nypol RE in one asphalt mixture and Shell's new bio-component binder Cariphalte CarbonSink in the second mix.

Asphalt milling, paving & compaction / March 6, 2023 1 minute Read

Hanson UK is trialling for the first time its low-carbon CarbonLock asphalt containing polymer modified bitumen (PMB) bio-binders on England's strategic road network.

Natural biogenic material absorbs and stores CO₂, which is then 'locked' into the bio-component binders (bio-binders). The CO₂ is not released back into the atmosphere, even when the asphalt is recycled.

Natural biogenic material absorbs and stores CO₂, which is then 'locked' into the bio-component binders (bio-binders)



RVO awards Avantium substantial subsidy

Half a million euros for lignin production for biobased asphalt



Chemical company Avantium announced that it has received a € 0.5 million grant for its participation in the CHAPLIN XL project



Production of biobased asphalt, in which fossil bitumen is replaced with lignin.



Allowing for a significant reduction in the carbon footprint of road construction.”

Lignin is a main component of woody biomass and is very suitable for energy generation. It has been produced since 2018 in the pilot biorefinery of Avantium in **Delfzijl**.

Effect of Used Cooking Oil on the characteristics of concrete including gap-graded aggregate

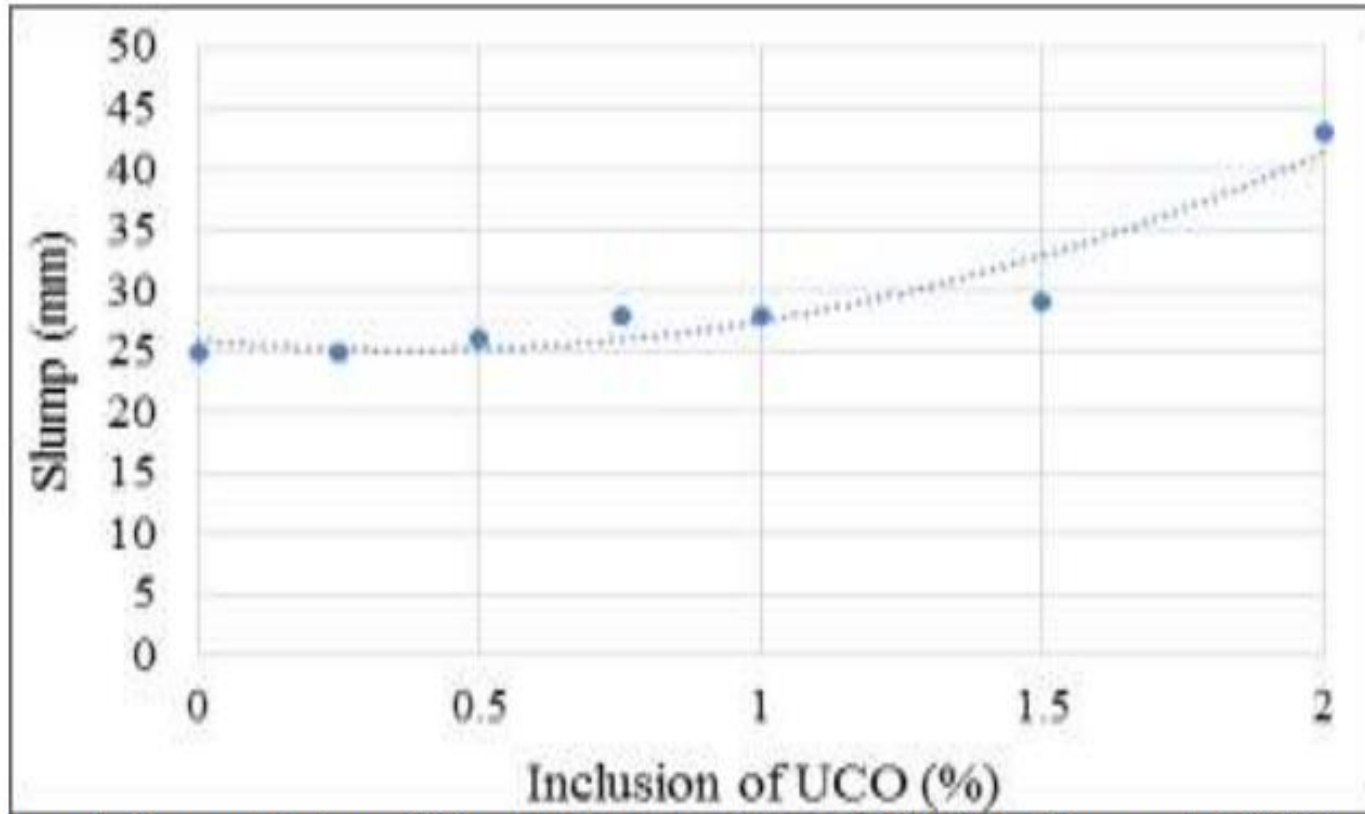


Figure 1 Slump Value of Concrete containing UCO (Beddu et al., 2015).



Figure 5 Concrete samples directly after casting.



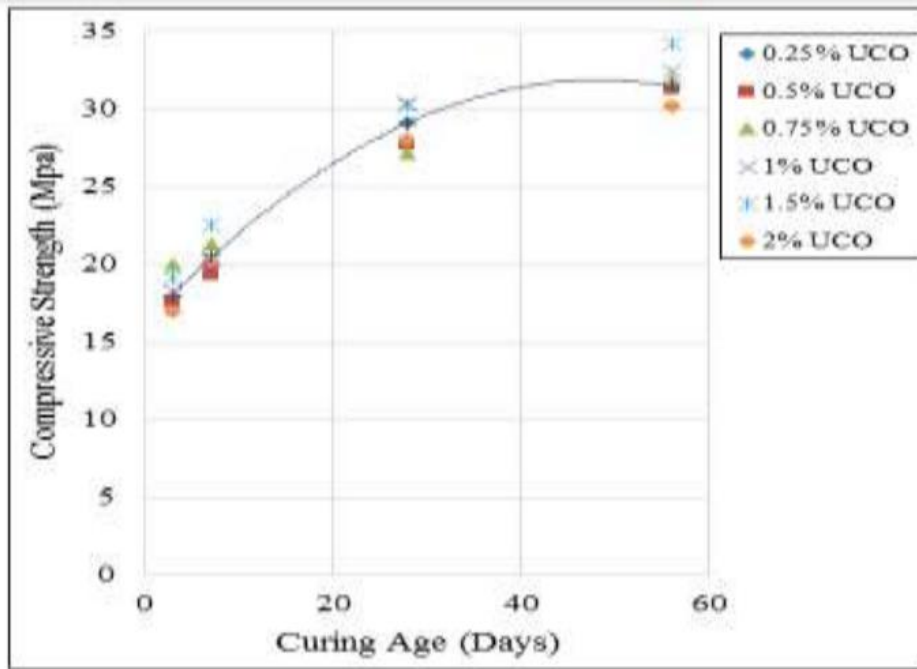


Figure 2 Compressive strength for concrete containing UCO (Beddu et al., 2015).

Table 1: Compressive strength for M20 grade concrete containing vegetable oil (VO) (Chandrasekar et al., 2016).

VO (%)	Compressive strength(N/mm ²)			
	3 days	7 days	14 days	28 days
0 (control)	5.02	9.5	13.48	20.97
1	5.65	9.04	11.08	16.63
1.5	6.55	9.06	14.95	21.53
2	6.27	8.88	11.34	17.96



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journal homepage: www.elsevier.com/locate/resconrec



Full length article

Transesterification of Waste Cooking Oil to Produce A Sustainable Rejuvenator for Aged Asphalt

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Shuguang Deng^{b,**}, Elham H. Fini^{a,*}

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Science of the Total Environment

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Kraft lignin as a bio-based ingredient for Dutch asphalts: An attributional LCA



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^c Roelofsgroep, Den Ham, the Netherlands

The results of the LCA revealed that using lignin in asphalts could reduce the climate change impact of top-layer asphalt products over their life cycle substantially (order between 30% and 75% depending on the type of asphalt considered).



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Carbon Capture Science & Technology

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Review

Biomaterials-based concrete composites: A review on biochar, cellulose and lignin



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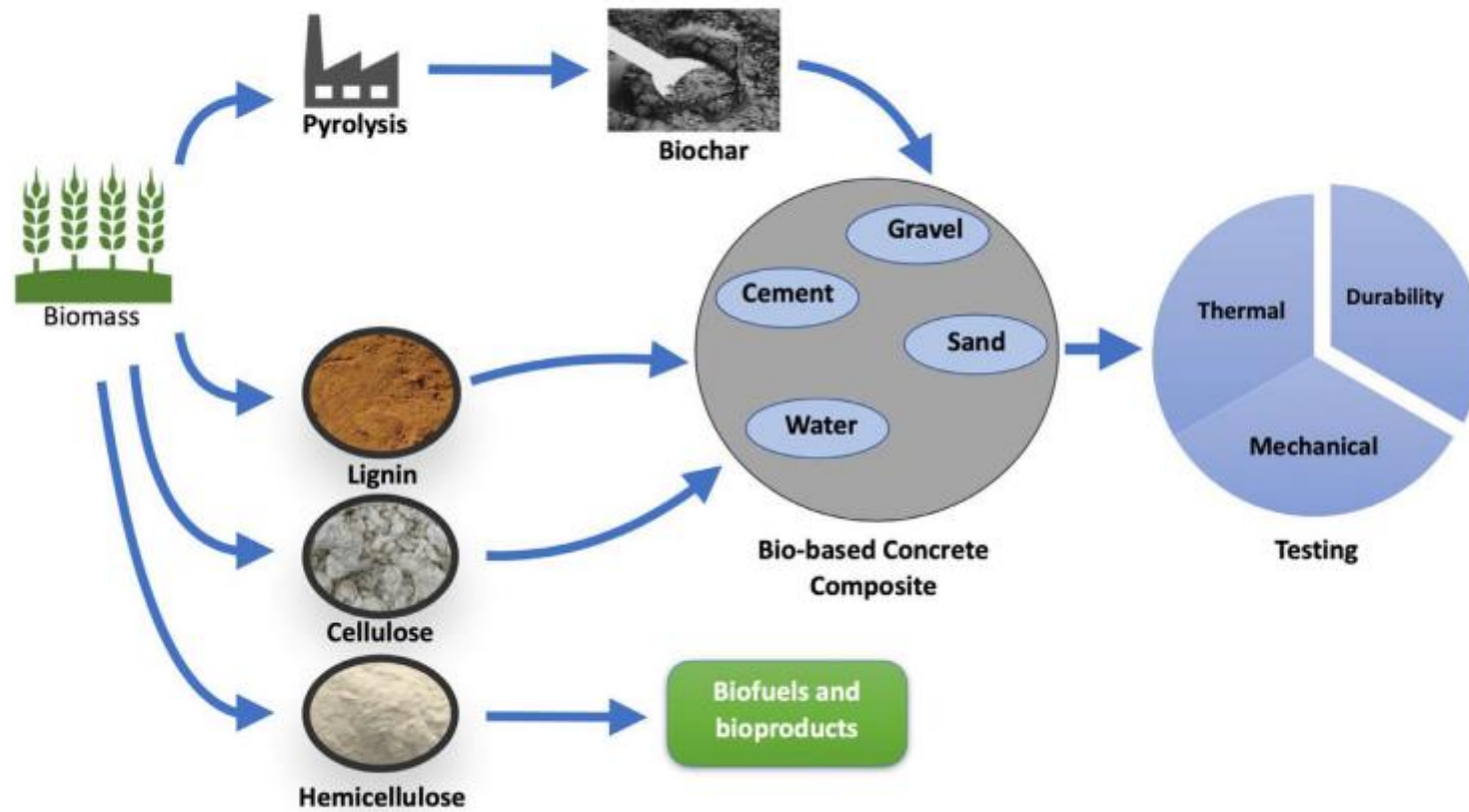


Fig. 1. Bio-based concrete composite production and testing using biomaterials as an additive.

Conclusions and perspectives

In recent years, asphalt is the main material in the asphalt pavement construction.

Because the rapid development of highway transportation

A great quantity of petroleum asphalt resources is consumed every year, Not renewable and increasingly depleted (Al-Sabaei et al., 2019; Dong et al., 2019).

Finding an economical and environmentally friendly material that can replace petroleum asphalt has become an urgent demand in the international road field (Mills-Beale et al., 2014; Wang et al., 2020).



Petroleum asphalt refers to a non-renewable energy source and is expensive, while the bio-binder is relatively cheap.

The current cost for producing 1 ton of bio-binder in China is 1500-2000 yuan, and it is much lower than petroleum asphalt (Sun et al., 2017; Zhang et al., 2017).

Bio binders are the substitute materials of petroleum asphalt that researchers have been looking for

- Solve the depletion of petroleum resources,

- Meet the requirements of sustainable development (Kumar et al., 2018; Wang et al., 2018).





The commercial use of green and sustainable concrete can offset the adverse environmental impacts of cement production.



However, the incorporation of lignin as bio-based materials in concrete can draw new direction for the sustainability in this sector.



Several studies have been reported and showed promising results for the use of these material in bio-concrete composite applications.



However, the feedstock and operating conditions used to extract lignin-based materials are quite important and need to be optimized.





From the literature, it can be found that lower feed concentration is beneficial for lignin (less than 2 %) to produce desire composite material with better mechanical properties.



The introduction of bio-based concrete composites as a carbon sequestering material can create economically beneficial and carbon negative environment.



Nonetheless, more life cycle and economic studies needs to be carried out in order to understand the overall process and commercialize it.



