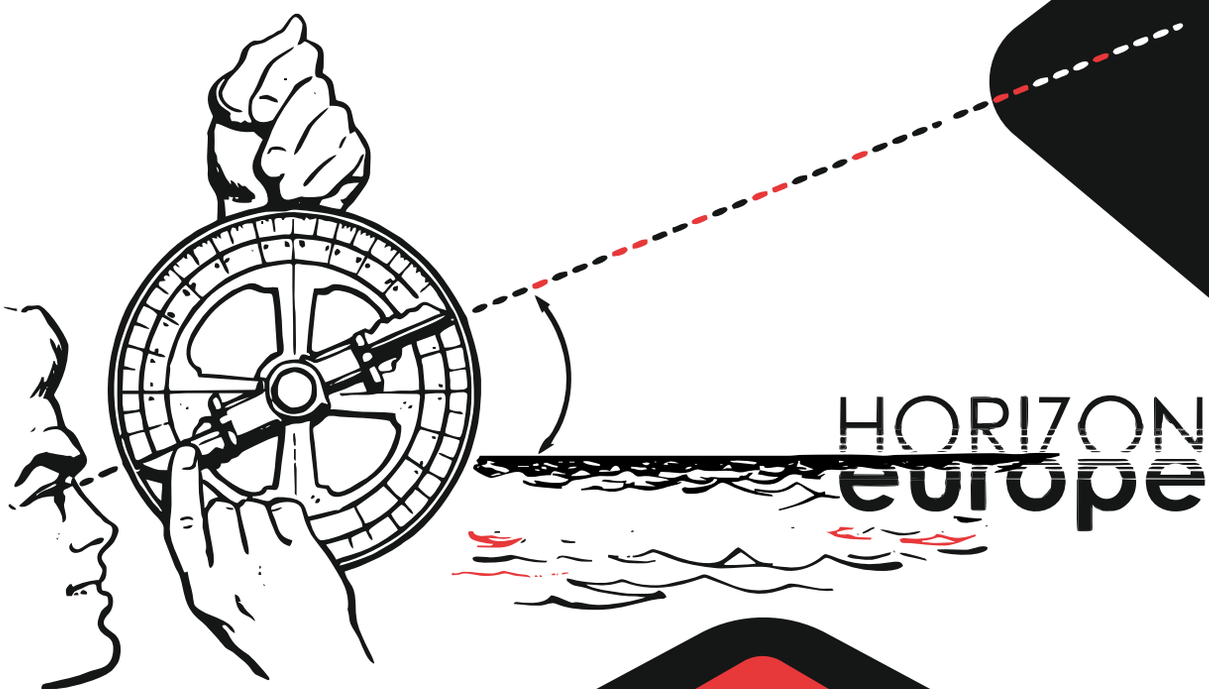


Łukasiewicz
Institute of Heavy
Organic Synthesis
BLACHOWNIA

HORIZON europe

TOPIC ID:
HORIZON-JU-CBE-2025-IA-05

SSbD Bio-based polymers/copolymers unlocking new market applications

Epoxy Vitrimer Composites with Inherent Recyclability

Type of project: IA

Call opening date: 4 April 2025 Call deadline: 17 September 2025

www.icso.lukasiewicz.gov.pl

ABOUT US

Advanced Materials Research Group of Łukasiewicz Research Network – The Institute of Heavy Organic Synthesis "Blachownia" specializes in developing of:

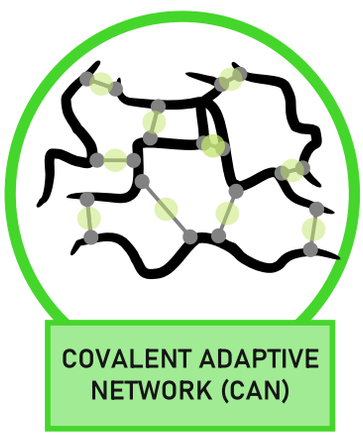
- technologies for producing and modification of bio- and fossil-based basic epoxy resins, epoxy vitrimers and glycidyl ethers,
- technologies for producing and modifying formaldehyde-free lignin resins,
- developing technologies for manufacturing polyurethanes (isocyanate and non-isocyanate),
- new types of fiber-reinforced, multi-material and high-filled biocomposites (prepregs, SMC, BMC)
- modification and processing of materials based on thermoplastic biopolymers,
- bio-based materials (alginates, starch, cellulose, chitosan, etc.) for coating applications, including PFAS-free, antibacterial and water/oil resistant coatings,
- plastic materials recycling.

OUR IDEA

Conventional, fossil-based thermosets possess a cross-linked molecular structure with covalent bonds. Typically, their reprocessing by melt processes is impossible, and the non-reversibility of the linkages makes the material recycling through chemical processes highly challenging and energy-intensive. We propose the development of epoxy bio- and waste-based polymer systems using an associative Covalent Adaptable Network (CAN), providing inherent recyclability of the cured polymer. The CAN bonds, unlike thermoset crosslinking, are reversible and enable the reprocessing of composites, creating new possibilities for the end-of-life of materials that can now be recycled, reused, and reprocessed into new composites, while maintaining the excellent mechanical properties of epoxy resins. The main application areas of the epoxy vitrimers are automotive parts, wind turbine blades, and construction composites.

HIGH PERFORMANCE COMPOSITE BASED ON A CROSSLINKED STRUCTURE:

- **irreversible cross-linking**
- **non-recyclable polymer matrix**
- **energy-intensive and unsustainable fibre recycling**
- **polluting, accumulate in landfields**



HIGH PERFORMANCE COMPOSITE BASED ON CAN:

- **reversible cross-linking**
- **recyclable polymer matrix**
- **energy savings in the recycling processes**
- **energy savings in the production of futher materials based on recyclates**

Damian Kiełkiewicz - Advanced Materials Research Group
Energetyków 9, 47-225 Kędzierzyn-Koźle, Poland
+48 77 487 33 61; +48 664 718 940
damian.kielkiewicz@icso.lukasiewicz.gov.pl