



THERMOFIRE Newsletter #1

Bio-based fire-retardant thermoplastic composites reinforced with natural fibres

Welcome to THERMOFIRE's First Newsletter

Dear readers,

We are excited to welcome you to the first edition of the THERMOFIRE newsletter! As a European research project supported by the Circular Bio-based Europe Joint Undertaking and its members, THERMOFIRE focuses on developing novel bio-based and recyclable composites with enhanced mechanical properties and fire resistance by using natural fiber reinforcements and bio-based halogen-free flame retardants.

This newsletter will serve as a platform to share updates on the project's progress, spotlight the contributions of our partners, and announce upcoming events and opportunities for collaboration. Thank you for joining us on this journey toward safer, more sustainable fire protection solutions.

Warm regards,
The THERMOFIRE Team

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The project THERMOFIRE has the objective to develop novel bio-based and recyclable composites with enhanced mechanical properties and fire resistance by using natural fiber reinforcements and bio-based halogen-free flame retardants.

The production of these novel composite materials will be scaled up and 3 types of demonstrators will be developed: aerospace, automotive and textile applications.

The key results to be achieved during the THERMOFIRE project are:

- Up to 100% bio-based TP polymeric matrices, 20% lighter than traditional resins.
- New halogen-FREE and bio-based flame retardants with low toxicity compared to commercial ones.
- Environmentally friendly and low-cost biobased cellulose fibers as reinforcement with CO₂ neutrality directly extracted from nature without further processing.
- Development of up to 100% bio-based TP composites with improved fire-resisting properties by using bio-based additives and/or by developing a new intrinsic bio-based polyamide 11 by introducing fire retardant monomer in its molecular chain.
- Verify the reusability and recyclability of the produced materials.
- Development of three prototypes adapted to the application requirements of the aerospace, automotive and textile sectors.
- Development of validation test of prototypes (TRL 5).

The THERMOFIRE project has fifteen specific objectives that are designed to deliver the project goal of developing bio-based and recyclable TP composites with bio-based flame retardants. The specific objectives cover 3 areas: Technological Objectives, Environmental Objectives and Economic Objectives.

[For more information, visit our official website](#)

Looking Back: Key Events

After a few months ahead in the project, we already attempted several events where we could present/talk about THERMOFIRE.

FURIOUS and THERMOFIRE Webinar: High-Performance Bio-Based Polymers – State of the Art and Challenges in Ending Plastic Waste

Date: 24 September 2024

Time: 11:00 - 12:00 CET

Location: Online

This joint webinar, hosted by the FURIOUS and THERMOFIRE projects, brought together experts to discuss advancements in bio-based polymers and their potential to transform the industry.

Missed the webinar? Watch the replay and access the presentations here

[**Replay**](#)



LIGNICOAT Online Workshop: Bio-Resins and Fire-Retardant Additives for Coatings

Date: 15 October 2024

Time: 09:00 - 13:00 CET

Location: Online

On October 15, the LIGNICOAT project hosted an online workshop in collaboration with the THERMOFIRE and VIABLE projects. The workshop explored the intersection of bio-resins and fire-retardant additives, with a particular focus on their applications in coatings and their future potential.

Missed the webinar? Watch the replay and access the presentations here

[Replay](#)



LIGNICOAT



JOINT ONLINE WORKSHOP BIO-RESINS & FIRE-RETARDANT ADDITIVES FOR COATINGS

October 15, 09:00 – 12:45 (CEST)

With the participation of



The LIGNICOAT project has received funding from the Bio-based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 101023342. The JU receives support from the European Union Horizon 2020 research and innovation programme and the Bio-based Industries Consortium.
The CBE JU THERMO FIRE project received funding from the European Union under the grant agreement no. 101112370.
The LIFE VIABLE project has received funding from the European Union under the grant agreement n° LIFE20-EN-GE-000671.

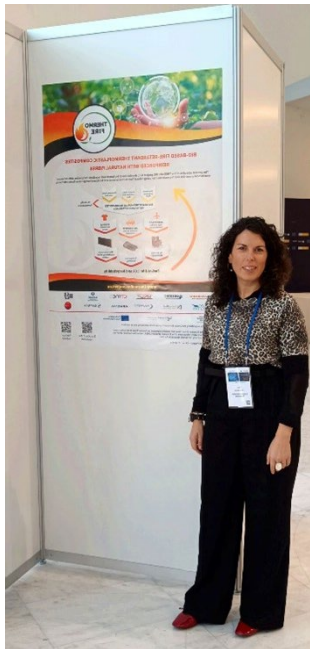
Consortium 18M Meeting

Date: 26-27 November 2024

Location: Logroño, La Rioja, España

The follow-up meeting for the THERMO FIRE CBE-JU took place in Logroño, La Rioja. It was a fantastic opportunity to review the progress and advancements achieved so far in this groundbreaking project. A big thank you to Geopanel for organizing this consortium meeting and for hosting us so warmly.





12 Conferencia del Programa Marco de la UE en España - Horizonte Europa

Date: 28 November 2024

Location: Oviedo, Asturias, España

On November 28, 2024, the 12th Horizon Europe Framework Programme Conference took place in Oviedo, Spain, organized by CDTI and partners. The event focused on analyzing the program's functioning, reviewing Spain's participation, and discussing strategies for the future 2028-2034 Framework Programme.

BIORING online workshop: Anticipatory LCA to promote informed decision-making in bio-based product development

Date: 4 December 2024

Time: 11:00 - 13:00 CET

Location: Online

The workshop on Life Cycle Assessment (LCA), held by the BIORING and SuperBark projects, brought together experts in material science, sustainability, and LCA to discuss strategies for effective analysis in biobased material research. The focus was on overcoming challenges in early-stage LCA, including data gaps and optimizing sustainability performance.

Missed the webinar? Watch the replay and access the presentations here

Replay

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BIORING **SuperBark**

THERMO FIRE

Bio-based fire-retardant thermoplastic composites reinforced with natural fibers

THERMOFIRE (GA101112370)

Yolanda Núñez - CTME

CTME

The project is supported by the Circular Bio-based Europe Joint Undertaking and its members.

Circular Bio-based Europe Joint Undertaking

Bio-based Industries Consortium

Co-funded by the European Union

Polymeris Scientific Day: Formulations and Specific Fillers

Date: 10 December 2024

Location: Grenoble, France

On December 10, 2024, POLYMERIS held its annual Scientific Day in Grenoble, focused on "Formulations and Specific Fillers: Between Innovation and Regulation." The event featured presentations on the latest technical advancements and regulatory challenges in formulations and fillers, showcasing research from academic and industrial members.

Progress Updates

Avanzare: Pioneering Sustainable Flame-Retardant Materials

As part of the THERMOFIRE project, Avanzare has focused on developing innovative flame-retardant additives for bio-based materials targeting the textile, automotive, and aviation industries. This aligns with the project's mission to reduce reliance on petroleum-based resources and enhance sustainability.

Avanzare's research emphasizes bio-based polymers like polyamide 11 (PA11), derived from castor oil, and natural fibers such as hemp, jute, and flax. These materials are known for their durability, strength, and low environmental impact. However, achieving effective flame retardancy without compromising their mechanical and thermal properties poses a significant challenge.



PA-11 with FR, flax fiber with FR and jute fiber functionalized.

Innovative Approach:

Avanzare has developed novel formulations combining graphene and bio-based additives derived from wood and other natural sources. These formulations create a physical barrier and

char layer under fire conditions, effectively preventing oxygen diffusion while enhancing material strength.

Highlights of Recent Progress:

- **Hemp Fibers:** New flame retardants have been successfully integrated into cellulose-rich hemp fibers using spraying methods by jute fibers.
- **PA11 Matrices:** Incorporating flame-retardant additives into PA11 has preserved its mechanical performance while significantly improving fire resistance.
- **Functionalized Natural Fibers:** Flax and cellulose fibers have been treated using immersion techniques, with promising results in both flame retardancy and mechanical stability.

Next Steps:

Further studies are underway to optimize the rheological properties of these formulations, ensuring ease of processing for industrial applications. Avanzare's work represents a critical step toward THERMOFIRE's overarching goal of creating high-performance, bio-based materials that are both recyclable and sustainable.

Arkema: Developing Intrinsically Fire-Retardant Bio-Based Polymers

Within the THERMOFIRE project, Arkema is pursuing a high-risk, low-TRL approach to revolutionize fire-retardant polyamide 11 (PA11). Unlike traditional methods that mix PA11 with flame-retardant additives, Arkema is inventing a new reactive route to synthesize intrinsically fire-retarded PA11 by incorporating phosphorus-based monomers directly into the polymer backbone.

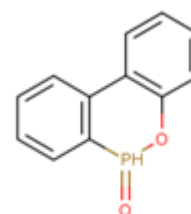
Innovative Approach:

The strategy focuses on developing phosphorus-containing diacid monomers through a two-step chemical reaction. The DOPO molecule (9,10-dihydro-9-oxa-10-phosphaphenanthrene-10-oxide) was selected for its well-documented reactivity, particularly its P-H bond, which reacts efficiently with double bonds through Kabachnik and Pudovik reactions.

Highlights of Recent Progress:

1. Synthesis of P-Containing Diacids :

- High-yield synthesis (>95%) of phosphorus-containing monomers was achieved.
- Characterization was conducted using NMR, TGA, and DSC techniques



2. Polymerization Challenges:

- Monomers were polymerized with bio-based aliphatic DA10 and amino undecanoic acid (Amino 11) using molten-state polycondensation.
- However, SEC analysis revealed low molecular weights and high polydispersity, indicating extensive branching and partial solubility.

- These issues stem from unexpected side reactions caused by grafted DOPO moieties, which are currently under investigation using model molecule approaches.

3. Initial Performance Testing:

- The synthesized bio-based PA11, containing 1 wt% phosphorus, was processed and tested under the UL94 standard, achieving a V2 ranking due to flaming drips.

Next Steps:

To address the challenges observed, Arkema plans to replace DOPO with two alternative phosphorus-containing building blocks that theoretically reduce side reactions. This transition is expected to yield better polymerization control and improved fire-retardant properties.

Arkema's innovative efforts are paving the way for bio-based, intrinsically fire-retardant materials, a critical advancement for the sustainability goals of the THERMOFIRE project.

UPCOMING EVENTS

JEC WORLD
2025 The Leading International
Composites Show

INVITATION



Networking Cocktail

Tuesday March 4, from 12:00 pm, on our stand: Hall 5-F97.

Join us for a networking cocktail bringing together industrial members from various clusters and projects: a unique opportunity to meet, share, and build new collaborations !

Discover our projects:



Date: 4 March 2024

Time: 12:00 - 14:00 CET

Location: JEC2025, Hall 5-F97

We're proud to represent THERMOFIRE CBE-JU and invite you to join us for a networking cocktail hosted by POLYMERIS. This event is the perfect opportunity to

dive into the latest advances in composite technologies and expand your professional network.

Register here [JEC NETWORKING COCKTAIL](#)

Stay connected

Stay updated with the latest news from THERMOFIRE:

Website: <https://www.thermofire-project.eu>

Email: elvira@avanzarematerials.com

LinkedIn: <https://www.linkedin.com/company/thermofire-cbe-ju/>

We welcome your questions, feedback, and ideas. Let's work together to revolutionize fire safety!

Thank you for your interest and support of the THERMOFIRE project. Stay tuned for more updates in the next edition of our newsletter. Warm regards, The THERMOFIRE Team.

[**Register to our newsletter**](#)



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