Unlocking potential: Advanced Lightweight Materials Challenges and innovations in key industrial sectors

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in advanced materials

We help deliver tangible, positive change to the world we live in; how we move, and what we build – by linking technology, business, society, and the environment.

We transform visionary ideas into tangible societal impacts.

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Make Ideas Happen

The Advanced Materials & Manufacturing United for LightwEighT (AMULET)

Project aims to consolidate novel value chains for multisectoral industrial applications enabled by advanced materials and their related manufacturing technologies, ultimately contributing to decarbonisation, resource efficiency through lightweighting and cost reduction.

Large scale demonstration projects: 2 Open Calls

Technical advice and training

Business-to-business coaching

15 finalists
Presenting their work at the EXPO today and tomorrow

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The Advanced Materials & Manufacturing United for LightwEighT (AMULET)

AMULET focuses on the following three advanced materials

Fiber-reinforced polymers

Light metal alloys

Ceramic matrix composites

and their implementation in four sectors

Automotive

Aerospace & aeronautics

Building

Energy

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Technology Roadmap

One of the key activities is to identify the most pressing challenges and suitable technologies in the field of advanced materials in four different sectors.

AMULET examined trends and innovations in material development to address these challenges, considering different development scenarios.

The Technology Roadmap creates an overview of the current European lightweight challenges, trends, relevant technologies, important players and market development, and a strategy for the future.

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Methodology

Workflow of the technology roadmap

Literature search

Fiber-reinforced polymers

Light metal alloys

Ceramic matrix composites

Automotive

Aerospace & aeronautics

Building

Energy

189 articles

4 workshops

42 survey responses

Technology Roadmap

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Sectors

Automotive

Aerospace
& aeronautics

Building

Energy

Sectors

Automotive

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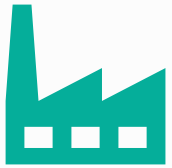
Mentimeter

What are the challenges in the automotive sector?

Drivers driving the automotive sector

Sustainability

Resource efficient manufacturing



Challenges and innovation

Recycling
- Materials ID passport

Greener supply chain
- Closed loop supply chain
- Sustainable sourcing

Predictive maintenance
- Smart materials

SSbD
- Modular design
- Self-healing polymers

Hybrid structural reinforcement
- Load-path optimised composites

Automation
- Machine learning and AI methods

Simulaiton of manufacutring processes
- Digital twins for component design

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Sectors

Aerospace & aeronautics

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Mentimeter

What are the challenges in the aerospace&aeronautics sector?

Drivers driving the aerospace&aeronautics sector

Fuel efficiency and emissions compliance

Maintenance cost optimisation

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Challenges and innovation

Circularity

- EoL strategy
- Bio-based materials

Multi material design

- Multifunctional composites
- Nanotechnology

Lack of suitable manufacturing methods

- Tooling design & in-mould sensing
- Digital tools

Predictive maintenance

- Digital twins
- Smart materials

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Sectors

Building

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Mentimeter

What are the challenges in the building sector?

Drivers driving the building sector

Sustainability

Regulations and standard

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Challenges and innovation

Recycling
- Waste valorisation

Material sourcing and availability
- Regenerative materials
- Bio-based materials

Long-term performance
- Self-healing materials
- Digital tools (Building Information Modelling)

Energy efficiency
- Phosphorescent building materials
- Building-integrated photovoltaics

Fire resistance and safety
- Fire resistant materials

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Sectors

Energy

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Mentimeter

What are the challenges in the energy sector?

Drivers driving the energy sector

Circularity

Energy efficiency

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Challenges and innovation

Increase resource efficiency

- Thin film technologies
- Nanomaterials
- Advanced composites

Energy conversion and performance

- Advanced design optimisation
- New materials for improving energy conversion

Productivity

- Automation

And the future looks like ...

The transition towards a sustainable, low-carbon future across various industries is being driven by the ambitious targets of the EU Climate Law and the European Green Deal.

The automotive industry must embrace innovation, cross-sector collaboration, and public-private partnerships to accelerate decarbonisation.

In the aerospace & aeronautics sector, advancing disruptive technologies and fostering collaboration will be key to achieving climate-neutral aviation.

The building sector is poised to play a crucial role in reducing emissions through energy efficiency and sustainable practices, despite upfront costs and regulatory complexities.

The energy sector's journey toward a fully renewable-based, integrated market highlights the critical importance of decarbonising energy supply to support broader economic and environmental goals.

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Make your ideas happen

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