

Advanced manufacturing technologies for Net-Zero industry

The Faculty of Materials Science and Technology (FMT) at VSB-TUO is committed to advancing sustainable manufacturing technologies and high-performance materials to support the EU's leadership in strategic net-zero industries. Our expertise aligns with the objectives of Horizon Europe's HORIZON-CL4-INDUSTRY-2025-01-TWIN-TRANSITION-05, which focuses on strengthening the EU's capabilities in clean, efficient, and innovative industrial manufacturing.

Why include FMT in your project?

Advanced manufacturing technologies for leadership of EU manufacturers in products for the Net-Zero industry

FMT's expertise ensures that the EU manufacturing industry benefits from increased production capacity for clean technologies while reducing strategic dependencies in accordance with the Net-Zero Industry Act. Our key areas of expertise include:

- **Advanced materials for sustainable manufacturing:**
 - Development of eco-friendly metal and composite systems for high-performance industrial applications.
 - Copper-free friction composites for automotive and rail transport, meeting environmental regulations.
 - High-performance conductors integrating nanostructured carbon (CNTs, graphene) for improved conductivity and sustainability.
- **Innovative production processes:**
 - Additive manufacturing and precision machining for lightweight, high-strength components.
 - Advanced forming and material shaping for improved durability and functional integration.
 - Surface processing technologies, including nano- and micro-manufacturing, for enhanced product performance.
- **Smart manufacturing and digital twins:**
 - Implementation of AI-driven process monitoring and real-time optimization.
 - Digital twin technology for predictive maintenance and process efficiency.
 - Flexible automation for complex assembly and hazardous material handling.
- **Circular & Sustainable manufacturing approaches:**
 - Remanufacturing and recycling strategies for material reuse and waste reduction.
 - Energy-efficient processing methods to minimize carbon footprint.
 - Standardization of environmentally friendly production protocols.

Infrastructure offered

With proven expertise in materials science, industrial process optimization, and sustainable production technologies, FMT offers comprehensive support covering the entire innovation lifecycle—from R&D to industrial-scale deployment. Our facilities include:

- State-of-the-art laboratories for additive manufacturing, advanced metrology, and environmental impact assessment.
- Cutting-edge equipment for material characterization, mechanical testing, and real-world performance validation.
- Smart manufacturing and digital integration capabilities enabling AI-driven process control, predictive modeling, and quality assurance.
- Collaborative innovation environment fostering partnerships with industrial leaders and academic institutions to accelerate market-driven solutions.

Contacts with industrial partners

ZF Group, Brembo, TMD Friction, Federal-Mogul, Honeywell Friction Materials, Škoda Transportation, Continental, Valeo, ArcelorMittal, Siemens Mobility, Bosch, Meritor.