

Press Release

Construction of Europe's Largest Federated Digital Infrastructure for Materials Research Launched

The MaterialsCommons project, coordinated by Fraunhofer IWM, connects 26 academic institutions from 14 countries. The development of new materials is to be accelerated by a factor of 4. Project start: June 1, 2026

With the MaterialsCommons project, a pan-European federated digital infrastructure for materials research and development is being created for the first time. Coordinated by Prof. Dr. Peter Gumbsch (Fraunhofer IWM/KIT), the project, funded by the European Commission under Horizon Europe with 28 million euros, brings together 26 research institutions from 14 countries with over 30 industrial partners, including Bosch, Siemens, ArcelorMittal, Infineon, Voestalpine, and Schaeffler. The goal is to unify Europe's fragmented materials data landscape and accelerate the development of new high-performance materials by a factor of 4.

Approximately 70 percent of all technical innovations are directly or indirectly attributable to materials. Yet the development of new materials from concept to market still takes 10 to 20 years, a timeframe that is no longer acceptable given climate targets, the energy crisis, and geopolitical upheavals. A key reason for this inertia is the high demand for and simultaneously difficult availability of existing materials data. This is rooted in the severe fragmentation of the European materials data landscape: data from research projects is scattered across numerous platforms, databases, and national initiatives, is barely interoperable, and is difficult to find and practically inaccessible for many stakeholders, particularly small and medium-sized enterprises. Inefficient data searches and redundant data collection alone generate estimated costs of over 10 billion euros annually across Europe. At the same time, global competition with the USA and China is intensifying in key technologies such as AI, microelectronics, and energy, all areas in which high-performance materials play a decisive role.

MaterialsCommons now creates a central, user-friendly entry point through which researchers from industry and academia will gain secure access to distributed data repositories, workflows, and AI tools without the need to centralize data. The federated architecture, i.e. the association of individual platforms that retain their autonomy, ensures data sovereignty and IP protection while enabling interoperability. Among the project's core innovations are shared ontologies, taxonomies, and metadata schemas as a »common language« for the materials

community. In addition, automated, multi-step research processes are being developed, so-called Self-Driving Lab workflows, in which experiments, simulations, and data analyses are orchestrated and executed without manual intervention, distributed across multiple laboratories and sites. Before the end of the project, over 90 percent of the most widely used European repositories are to be accessible through a single interface.

June 3, 2026Page 2 | 3

The infrastructure will be validated in six industrial use cases: battery materials with Siemens as an industrial partner, among others; bainitic steels with Bosch, ArcelorMittal, Voestalpine, and Schaeffler; quality assurance in additive manufacturing with Schaeffler and Applus; and materials for microelectronics with Infineon and Siemens. The industrial partners expect significant time savings and massive cost reductions in individual development processes.

To ensure sustainability beyond the four-year project duration, a MaterialsCommons Foundation will be established to coordinate operations and bring together partners, national hubs, and industry. Prof. Peter Gumbsch, the MaterialsCommons coordinator, is also a member of the Executive Board of the EU Innovative Advanced Materials Initiative (IAM-I), which serves as the organisational framework ensuring the connection between the digital infrastructure and industrial implementation.

The urgency of the undertaking arises directly from the geopolitical and economic situation: the OECD forecasts a 40 percent increase in global resource consumption by 2040, fossil fuel dependence is increasingly being replaced by dependence on critical raw materials, and the EU Critical Raw Materials Act, the Net-Zero Industry Act, and the Ecodesign Regulation require new materials at a pace that is unachievable with conventional methods. Every year without such an infrastructure means billions in losses due to inefficient data use, slowed innovation cycles, and delayed achievement of climate targets. MaterialsCommons is therefore not merely a technical infrastructure project, it is a strategic investment in Europe's industrial future viability, resilience, and prosperity.

Fact box

Project: MaterialsCommons – Federated Digital Infrastructure for European Advanced Materials Research and Development.

Funding: Horizon Europe, HORIZON-CL4-INDUSTRY-2025-01-MATERIALS-45

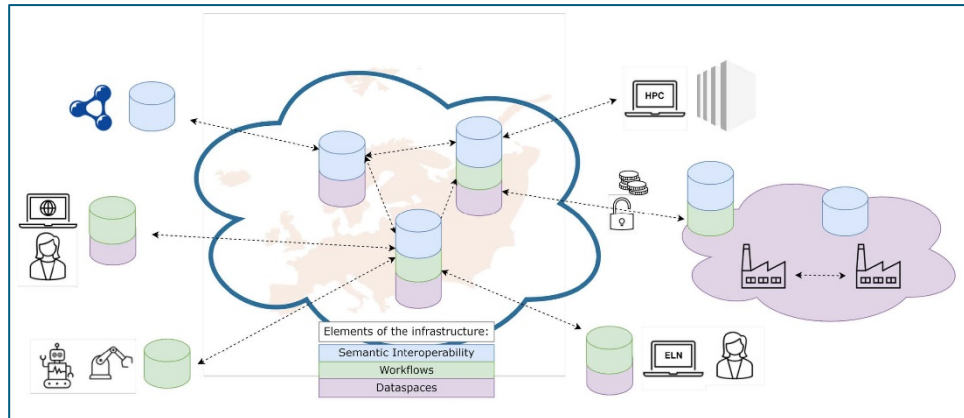
Coordination: Prof. Dr. Peter Gumbsch, Fraunhofer IWM/KIT.

Consortium: 26 partners from 14 countries, over 30 associated partners

Duration: 48 months

Objectives:

- Web portal providing access to autonomous materials data platforms from 14 countries
- Factor-4 acceleration of the development of new materials
- Self-Driving Lab demonstrators



© Fraunhofer IWM

The MaterialsCommons concept enables materials scientists and engineers to gain seamless, secure, and interoperable access to data repositories through a single entry point, using a federated infrastructure.

The Europe-spanning blue cloud represents the federated infrastructure that connects researchers from academia and industry while integrating previously isolated resources. The coloured building blocks symbolize the three technical elements of the infrastructure: Semantic interoperability (blue), workflows (green) and dataspaces (violet). Starting from the upper right and moving counterclockwise, the figure illustrates: (i) High-Performance Computing (HPC) facilities providing large-scale computational resources; (ii) semantically linked FAIR (Findable, Accessible, Interoperable, and Reusable) data enabling interoperability and machine-actionable data exchange; (iii) a user-friendly access layer that provides first-time users with an overview of available services; (iv) the orchestration of SDLs (self-driving laboratories), enabling automated synthesis and cycling experiments at partner laboratories while continuously streaming real-time data into a shared knowledge graph; (v) Electronic Lab Notebooks (ELNs) supporting digital experiment documentation and data management; and (vi) industrial vendors contributing data and services for commercial distribution. Together, these components form a digital ecosystem that supports collaborative, data-centric, and AI-enabled materials research and development across organizational and geographical boundaries.

The **Fraunhofer-Gesellschaft**, headquartered in Germany, is one of the world's leading organizations for applied research. It plays a major role in innovation by prioritizing research on cutting-edge technologies and the transfer of results to industry to strengthen Germany's industrial base and for the benefit of society as a whole. Founded in 1949, the Fraunhofer-Gesellschaft currently operates 74 institutes and research units throughout Germany. Its roughly 30,000 employees, predominantly scientists and engineers, work with an annual business volume of 3.6 billion euros; 3.2 billion euros of this stems from contract research.

The **Fraunhofer Institute for Mechanics of Materials IWM** works on sustainability in industrial value creation. For industrial companies and public sector clients, the institute opens up new opportunities for innovation in the areas of component durability and safety, resource efficiency in process chains, and energy efficiency of machinery. To this end, the institute creates digital representations of materials in processes, components, and machines, making their behavior and properties predictable. The institute empowers companies to utilize materials in a data-driven manner as a key to competitiveness and sustainability.

Contact

Press Kontakt

Thomas Götz

Fraunhofer Institute for
Mechanics of Materials IWM
Corporate Communications and
Strategy
Phone +49 761 5142-153
thomas.goetz@iwm.fraunhofer.de

Scientific Contacts

Dr. Anandi Kugele

Fraunhofer Institute for
Mechanics of Materials IWM
General Management
MaterialsCommons
Phone +49 761 5142-161
anandi.kugele@iwm-extern.fraunhofer.de

Prof. Dr. Peter Gumbsch

Fraunhofer Institute for
Mechanics of Materials IWM
Director
Phone +49 761 5142-100
peter.gumbsch@iwm.fraunhofer.de

www.iwm.fraunhofer.de

