

LEAPS Position Paper on the European Advanced Materials Act (AMA)

Executive Summary

The European synchrotrons and free electron lasers united in LEAPS welcome the European Commission's initiative to develop an Advanced Materials Act (AMA) as a strategic instrument to strengthen Europe's technological sovereignty, industrial competitiveness, and sustainability.

LEAPS facilities serve a large, multidisciplinary user community and host research infrastructures with world-class characterisation capabilities that support advanced materials research and innovation across the full value chain, from fundamental discovery to industrial deployment.

Building on the Communication on Advanced Materials for Industrial Leadership, this position paper demonstrates how synchrotrons and FELs can directly address the major structural challenges identified by the Commission. LEAPS calls for the systematic integration of lightsources into the design and implementation of the AMA to maximise EU added value, reduce fragmentation, and accelerate industrial uptake of advanced materials.

1. Strengthening the European Research and Innovation Ecosystem

1.1 Reducing Fragmentation and Enhancing EU-wide Coordination

Fragmentation of the European research and innovation ecosystem remains a major barrier to progress in advanced materials. Though mostly financed as national labs, LEAPS facilities bring together European researchers and innovators, provide platforms for multidisciplinary research and enable cross-border collaboration and shared use of cutting-edge infrastructures.

LEAPS recommendation: The AMA should recognise the LEAPS facilities as coordination hubs that help align national materials research efforts, bridge gaps between national programmes, and maximise the impact of public R&I investments at European level.

1.2 Open Access to World-Class Infrastructure for Industry

Synchrotrons and FELs provide shared, state-of-the-art experimental capabilities that are otherwise inaccessible to most companies, particularly SMEs and start-ups. Open access reduces capital expenditure, lowers technological risk, and accelerates innovation cycles.

LEAPS recommendation: The AMA should facilitate access programmes to these facilities for SMEs and start-ups, with priority alignment to EU strategic objectives, including clean technologies, digital technologies, and materials relevant for alternative energy systems and for a circular economy. materials.

1.3 De-risking Innovation and Leveraging Private Investment

High-quality, validated experimental data are essential to reduce technological uncertainty in advanced materials development. Synchrotron- and FEL-based characterisation provides robust evidence on material performance, reliability, and scalability.

LEAPS recommendation: The AMA should leverage LEAPS lightsources as de-risking instruments that improve the attractiveness of advanced materials projects for industrial partners and private investors, particularly at pre-competitive and scale-up stages.

2. Digitalisation and Acceleration of Innovation Cycles

Long innovation timelines and insufficient digitalisation continue to hinder Europe's competitiveness in advanced materials. Synchrotrons increasingly combine high-throughput experimentation, automation, and advanced data analytics to accelerate discovery and optimisation processes.

LEAPS recommendation: The AMA should support the development of standardised data formats, interoperable platforms, and FAIR-compliant repositories for synchrotron-generated data, and promote their integration with European digital innovation hubs, materials informatics initiatives, and regulatory sandboxes.

3. Bridging Research and Industrial Uptake

A persistent gap between research results and industrial application slows the deployment of advanced materials. Lightsources provide unique experimental services used jointly by academia and industry, creating trusted environments where new collaborations emerge and research breakthroughs are translated into industrial solutions.

LEAPS recommendation: The AMA should support lightsource–industry collaboration schemes, including validation activities, pilot-line support, and dedicated transition instruments that facilitate scale-up and manufacturing readiness.

4. Enabling Circularity and Safe-and-Sustainable-by-Design Materials

Advanced materials must support Europe's transition to a circular and sustainable economy. Lightsource-based techniques provide atomic- and nanoscale insight into material degradation, ageing, toxicity, recyclability, and lifecycle performance. The impact of this capabilities of materials R&D for a circular economy has already been proven in ReMade-at-ARI.

LEAPS recommendation: The AMA should allocate dedicated funding for circular advanced materials R&D at synchrotron and FEL facilities, explicitly supporting safe-and-sustainable-by-design approaches and requiring industrial participation to ensure rapid translation into practice.

5. Testing, Standards, and Regulatory Support

Limited access to testing and experimentation facilities and the lack of harmonised standards remain obstacles for market entry, particularly for SMEs.

LEAPS recommendation:

- Recognise the LEAPS facilities as European testing and experimentation infrastructures under the AMA.
- Support the development of harmonised material characterisation protocols and benchmark datasets, ensuring interoperability of data and methodologies across research infrastructures.
- Facilitate the use of synchrotron-generated evidence (e.g. XRD, XRF) within regulatory sandboxes and pre-competitive compliance processes.

6. Skills, Talent, and Workforce Development

Lightsources are unique training environments where researchers and technical staff acquire interdisciplinary skills spanning physics, chemistry, engineering, data science, and industrial problem-solving. They therefore contribute directly to addressing skills shortages in deep tech and advanced manufacturing.

LEAPS recommendation: The AMA should explicitly recognise lightsources as skills-development hubs and fund cross-sectoral training schemes, including joint PhD programmes, industrial postdoctoral positions, junior scientist positions as a new profession at RIs bridging between societal challenges or industry needs and fundamental research at the beamline, staff exchanges between research infrastructures and industry, and inclusive training initiatives that broaden participation in advanced materials careers.

7. Key Messages for the Advanced Materials Act

LEAPS invites the European Commission to:

1. Explicitly recognise the European synchrotrons and FELs as strategic enablers of the Advanced Materials Act.
2. Integrate lightsources into AMA funding instruments, governance structures, and implementation pathways.
3. Leverage lightsource-generated data and expertise to reduce fragmentation, de-risk innovation, and accelerate industrial uptake of advanced materials.
4. Use the AMA to reinforce Europe's leadership in digitalised, circular, and safe-and-sustainable-by-design advanced materials.

LEAPS stands ready to work closely with the European Commission, Member States, and industrial stakeholders to support the successful implementation of the Advanced Materials Act.

Radiation and Free Electron Laser user facilities in Europe. These unique facilities work like giant microscopes, harnessing the power of electrons to produce bright light that scientists can use to study anything from viruses to novel battery materials. LEAPS facilities serve a broad scientific community of more than 35,000 researchers in Europe.