European Innovation Council

Pathfinder Portfolio: Engineered Living Materials

Overview of activities carried out in 2nd year of the portfolio and overview of activities planned for the 3rd year

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1. Introduction

Engineered living materials (ELMs) are materials composed, either entirely or partly, of living cells, thereby enabling new functionalities that are responsive to the environment. By being alive, ELMs represent a fundamental change in how materials are produced and what functions they can perform, with the potential to decrease costs and environmental impact. The EIC identified Engineered Living Materials as a priority area in March 2020, and issued a targeted call on this topic in 2021. The projects awarded under this call joined forces to form the EIC ELMs portfolio.

The ultimate goal of the EIC ELMs Portfolio is to strategically position Europe at the forefront of the ELMs field via specific activities aimed at advancing the technologies for ELMs production; at increasing the visibility of the European ELMs community internationally; at addressing ethical, societal, legal and regulatory aspects related to ELMs; and at identifying barriers to the future adoption and commercialization of ELMs. To achieve these goals the EIC ELMs portfolio has agreed on a strategic plan, which was published in 2023 and is available here.

The current document includes an overview of the portfolio activities carried out from the publication of the strategic plan until November 31, 2024. During this period the following projects contributed to the portfolio:

- *Bio-HhOST*
- *Fungateria*
- *NextSkins*
- *SUMO*
- *BioRobotMiniHeart*
- *LoopOfFun*
- *Prism-LT*

2. Activities carried out in the 2nd year of the EIC Pathfinder Engineered Living Materials Portfolio

2.1. Portfolio composition and areas of activity

A key objective of the ELM Portfolio is to gather and give visibility to the European ELMs community. As such, from its inception the ELMs strategic plan envisioned the possible addition of relevant projects from EIC Open calls. In 2024, one such project (*Bio-HhOST*) was invited and successfully joined the portfolio through an EIC Booster grant, and three additional invitations were issued to include additional projects in 2025.

Overall, work progressed in all target areas laid out in the strategic plan during 2024. As part of these activities significant synergies were identified between the regulatory working group, and the working group on ethical, legal and societal aspects (ELSA). This reflects the intertwined nature of these fields within the development of Engineered Living Materials (ELMs): ethical and social considerations are deeply linked to regulatory frameworks, as both aim to address issues of safety, societal impact, and responsible innovation. The two working groups were therefore merged for future joint activities, with the overall goal to conduct a normative analysis of moral principles, legal and regulative frameworks and societal values (including public perceptions and user experience) in the development of ELMs, ensuring long-term application and scaling possibilities. By framing ELSA-related topics and regulatory requirements as cumulative efforts, the initiative assesses the societal impact of emerging technologies and helps steer innovation in ways that promote broad adoption and societal embedding.

In November 2024, the Portfolio Working Groups, together with the Steering Group further reviewed the ELM Strategic Plan, setting clear priorities for the remaining three years of the Portfolio.

2.2. Annual meetings

In 2024, two annual meetings took place: The 1st annual meeting was held in Brussels in hybrid mode on the 17th of January 2024, while the 2nd annual meeting was held in hybrid mode on September 18 in Saarbrücken, Germany, and associated with the 4th international ELMs conference. Both meetings were marked by their efforts to discuss not only the progress of the ELM projects and portfolio activities, but also to create connections with the wider ELM community.

During the 1st annual meeting, organized by EISMEA, at least 3 members for each portfolio project participated in person, with additional representatives from three projects of the Pathfinder Open with relevance to ELMs (Bio-HhOST, Enlight and CyGenTiG). The ELMs projects presented in the morning, followed by a brief discussion on the WG activities, and a "readiness for investments" section with speakers from SynBioBeta, Potter Clarkson and EureKARE.

Attendees of the 1st EIC ELM Portfolio annual meeting.

Attendees of the 2nd EIC ELM Portfolio Meeting in Saarbrücken.

The 2nd Annual Meeting was organized by the LoopOfFun and NextSkins portfolio projects. There were 140 attendees, including representatives of the EIC ELMs portfolio projects BioRobot-MiniHeart, Bio-HhOST, Fungateria, NextSkins, LoopOfFun, PRISM-LT and Sumo, and participants of the 4th International Conference on Engineered Living Materials, including recent awardees of the Priority Programme in ELMs of the German Research Foundation. The EIC ELMs symposium was opened and closed by inspiring talks from Jamie Davies, University of Edinburgh, from the EIC Pathfinder Open project CyGenTiG, and Chao Zhong, Shenzhen Institute of Synthetic Biology. It was associated with the 4th international ELMs conference as the "EIC ELMs Portfolio Symposium", which was vital to enable such active participation of the broader ELMs community.

2.3. Progress highlights from the working groups

In 2024, multiple portfolio working groups already achieved some major outputs, in particular related to Communication and Dissemination; Regulatory and ELSA activities and Sustainability.

Communication and Dissemination: Driven by the project PRISM-LT, the EIC ELMs portfolio has successfully applied to the Horizon Booster in 2023 to create a common dissemination strategy for a cluster of projects. This work was brought to fruition in 2024, resulting in:

+ a *video* of the EIC ELMs portfolio;
+ an EIC ELMs factsheet brochure;
+ social media cards, and a portfolio presentation template for use by the projects;

A screenshot from the ELMs portfolio video.

Furthermore, all projects received a set of social media guidelines to set up a joint portfolio social media campaign and additional guidelines for advertising campaigns on Twitter (now X) and LinkedIn, KPI setting and monitoring and tracking.

Regulatory and ELSA activities: Work focused on increasing awareness of ELMs with key stakeholders. On the regulatory side, the portfolio engaged with the European Medicines Agency (EMA) to discuss and address regulatory gaps specific to health-related ELMs products, with a focus on patient translation, inviting EMA representatives to the 1st Annual Portfolio Meeting in January 2024, contributing to internal EMA documents on ELMs and preparing a workshop with EMA representatives in 2025. To connect with a broader group of stakeholders, the WG (with the leadership of the PRISM-LT project) also put together a plan for an international summer school in 2025, with the aim of bringing together ELMs researchers at all career stages with experts of ELSA and regulatory questions.

Environment and Sustainability: ELMs have the potential to be products with reduced environmental impact. However, given that ELMs are a fundamentally new type of materials, to date no standardized methodology exists to assess the environmental impact of the lifetime of these products. The Environment and Sustainability working group therefore focused on understanding how life-cycle analysis (LCA) methods could be developed specifically for early-stage exploration of ELMs. As a first step, a workshop was organized in September-October 2023 with the support of the Horizon Standardization Booster (HSbooster) and involvement of experts from Danish Standards together with Mirko Busto (an LCA expert, member of Prism-LT project). The workshop consisted of a series of three online sessions given on How to influence standardization using ELMs relevant standards/committees as examples, CE-marking products for the European market and Life Cycle Assessment standards. Based on the workshop, the working group

developed a strategy towards establishing a methodology for LCA, and in November 2024 a Booster grant to support these activities, was submitted under the joint leadership of Fungateria, NextSkins and Prism_LT projects.

Technology: To facilitate exchanges on technology between EIC ELM portfolio projects and to empower early career researchers to participate in joint activities, the ELMs portfolio has created a platform under the leadership of LoopOfFun and NextSkins. The platform enables the exchange between postdocs and graduate students within the ELMs portfolio. The platform aims to promote exchange to overcome similar technical challenges and share best practices. The platform is organized in "Technical Focus Group" channels based on the common technical aspects shared by a sub-group of projects. The platform also allows sharing important publications from the EIC ELMs projects or from the outside scientific community relevant to ELMs. In addition, a Monthly Seminar Series kicked off in November of 2024 led by LoopOfFun, Bio-hHOST, and SUMO to be run by graduate students and postdocs of the ELMs portfolio as a forum to share research progress and challenges in a short seminar format, and to invite speakers of interest. The first event was held on 19 November 2024 and introduced the students and postdocs to the other projects in the ELMs portfolio.

Path to Market: To bring ELM technology to marketable products, the EIC ELM portfolio projects are currently assessing the hurdles of bringing such innovations to the market. The EIC ELM portfolio projects have identified key challenges that the ELM innovations could solve and have identified the key stakeholders that play a pivotal role on the progress of the ELM innovations to the market. The EIC ELM portfolio projects are now starting to engage with such key stakeholders to validate the main path to market hurdles identified and discuss strategies for overcoming such hurdles to facilitate societal and industrial impact.

3. Planned activities of the 3rd year of the EIC Pathfinder Engineered Living Materials Portfolio

For 2025, ELMs portfolio projects plan to further continue their efforts to bring together the community, adding new projects from the EIC Pathfinder Open calls that are developing technologies related to ELMs. Multiple activities initiated in previous years will come to fruition in 2025, such as the ELSA summer school, development of LCA methodology, joint regulatory workshop with EMA. The projects further aim to reflect extensively on all portfolio activities as part of their individual review meetings, as well as an extended 3rd annual meeting, which will be organized September/October 2025. The portfolio will also be laying the groundwork for at least one future comprehensive whitepaper on the state of the art of Engineered Living Materials in Europe.

4. Conclusions and recommendations

The ELMs Portfolio has already established an extensive track record of activities that go beyond the tasks and achievements of individual projects. Given the activities already planned for the remaining years, it is likely that this momentum will remain until the end of the portfolio.

For the future, it is therefore recommended to ensure the long-term impact of the ELM and maintain longevity and sustainability of the portfolio outputs beyond the duration of individual consortia and even the ELM portfolio itself. To this end, the ELM Steering Committee has already started investigating what structure or organization can promote and coordinate ELMs research in Europe, thus strategically positioning Europe in the ELMs field and supporting the potential of ELMs uptake in many economic sectors.

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