

Turkish SME specializing in additive manufacturing of metallic/polymeric implants is seeking EUROSTARS partners to develop a coating for mineralization and/or antibacterial effect for implants having trabecular and smooth surfaces.

## Summary

Profile type	Company's country	POD reference
<b>Research &amp; Development Request</b>	<b>Türkiye</b>	<b>RDRTR20231218019</b>
Profile status	Type of partnership	Targeted countries
<b>PUBLISHED</b>	<b>Research and development cooperation agreement</b>	<b>• World</b>
Contact Person	Term of validity	Last update
<b><a href="#">Sabrina WODRICH</a></b>	<b>19 Dec 2023</b> <b>18 Dec 2024</b>	<b>19 Dec 2023</b>

## General Information

### Short summary

A Turkish SME, active in the field of additive manufacturing of metallic/polymeric implants, is capable of fabricating parts from bioresorbable Mg alloy. Implants are planned to be fabricated in forms suitable for orthopedic applications. The company is seeking partners to jointly apply to EUROSTARS to develop surface coatings to enhance the mineralization and/or to impart antimicrobial properties for implants having trabecular and smooth surfaces.

### Full description

The Turkey-based SME has an SLM infrastructure in the additive manufacturing of titanium and its alloys and has SLS (selective laser sintering), FDM (fused deposition melting), and SLA (stereolithography) infrastructure for the additive manufacturing of polymeric materials. In addition, it has experience in biodegradable polymer composites and their production via FDM and SLS technologies to provide customized solutions for cranio-maxillofacial defects occurring in pediatrics. The company has developed Turkey's first trabecular hip prosthesis, of which there are less than 10 examples in the world, with the know-how gained from the personalized prostheses it has been working on for many years. The product was CE-certified in class III and became Turkey's first mass-produced product manufactured with AM. Moreover, the company has successfully performed 3D medical modeling and customized

implant production for the last decade. Considering the dynamics of the Orthopedics and AM market, a strategic road map was created, and it is aimed to grow in a more focused manner by transforming the structure into a separate company and developing mass-production products in the fields of spine, knee, and trauma.

The SME aims to expand its product range with biodegradable metal implants for use in the orthopedic field. With knowledge to be developed in collaboration with the partners, this material and production process can be extended. The solutions are specifically aimed at pediatric cases.

Surface coatings increase implant efficiency and positively affect the quality of life of patients. They were demonstrated to increase the initial stability of orthopedic implants, improve cell proliferation and functions, enhance osseointegration, provide antimicrobial properties, and allow the release of therapeutics. In addition to its biological functions, surface coating can slow down the degradation rate of biodegradable implants.

The SME's additive manufacturing infrastructure is suitable for the use of Mg-based biodegradable alloys. Considering that biodegradable metals are increasingly used in orthopedic applications, the SME aims to increase its experience in biodegradable metal applications. It is planned to study parameters such as the degradation rate of implants, in vitro cellular viability and functions, in vivo bone formation and toxicity, mechanical strength, and fatigue performance, as well as optimize the production process parameters and post-processing of Mg-based alloy. The aim is to make the final product suitable for the selected implantation site, whose properties are well-understood, by imparting an external bioactive and biodegradable surface coating.

The Company is seeking a strategic collaboration with an innovative company to revolutionize the field of orthopedic implants through the development and application of advanced coatings on biodegradable magnesium implants. This innovative venture aims to enhance implants, addressing a critical need in the medical industry for more effective orthopedic solutions. SME's expertise in orthopedic implant technology with additive manufacturing, combined with the partner's prowess in specialized coatings, presents a unique opportunity to lead the market in this cutting-edge domain. This collaboration not only paves the way for significant advancements in patient care but also unlocks substantial market potential in a rapidly growing sector of medical technology.

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#### Advantages and innovations

Leveraging advanced additive manufacturing (AM), the company is set to revolutionize the orthopedic sector, catering to both adult and pediatric needs with innovative biodegradable magnesium implants. The market for magnesium alloys, currently valued at \$1.41B (billion), is expected to soar to \$3.60B by 2028, growing at a CAGR of 12.51%.

Simultaneously, the biodegradable magnesium-based implant market is projected to expand from \$120M (million) in 2022 to \$148.9M by 2029, with a CAGR of 3.1%. This growth underscores the vast potential of biodegradable magnesium implants in the medical device sector. Despite the current market being limited in competitors and dominated by academic research, its potential for expansion and innovation is substantial.

Bioresorbable magnesium-based implants are revolutionizing the orthopedics field, not only due to their biodegradable chemistry but also their physiological compatibility and bone-healing benefits. Their nature, coupled with physiological compatibility and bone-healing properties, makes them a game-changer. These implants release magnesium ions as they degrade, promoting bone growth and inhibiting osteoclast genesis. This is particularly advantageous in pediatric orthopedics, where traditional implants often require multiple surgeries for removal or replacement.

AM has enabled the fabrication of porous biomaterials that satisfy the bone-mimicking mechanical properties and fully interconnected porous structures with precisely controlled topological parameters. The SME having SLM infrastructure in metal additive manufacturing and experience in the use of different alloys, is in a highly advantageous position. The SME utilizes its existing infrastructure in additive manufacturing to not only fabricate various orthopedic implants but also have the know-how to carry the regulatory processes to secure the CE mark for commercialization.

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#### Technical specification or expertise sought

In SMEs' pursuit of advancing biodegradable Mg alloy-based orthopedic implants through SLM, they are highlighting the organization's robust capabilities in this domain. With an established foundation in Mg alloy properties and extensive experience in SLM technology, they excel in optimizing process parameters for the intricate production of lattice structures, particularly in thin-walled implant surfaces.

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Additionally, the SME is looking for a partner with specialized knowledge in various surface coating techniques, with a strong emphasis on calcium phosphate application for the promotion of mineralization and enhancing biological integrations. The selected partner is expected to possess expertise in coating methodologies, ensuring uniform and effective coverage to establish a robust interface between the implant and surrounding biological tissues. Moreover, the SME seeks collaborators who can contribute unique insights into alternative coating methods, particularly those designed to impart antibacterial surface features. Proficiency in exploring nanostructured coatings or incorporating antibacterial agents will be instrumental in achieving a comprehensive solution that addresses critical aspects of implant biocompatibility and infection prevention. Prospective partners are encouraged to showcase a strong background in surface engineering. Previous experience in the development of orthopedic implants, especially those with a focus on pediatric applications, would be highly valued. The ability to optimize Mg alloy printing, lattice structure design, and advanced calcium phosphate coating techniques will be crucial to the success of this collaborative endeavor. SME invites organizations and experts with a commitment to pushing the boundaries of orthopedic solutions to join them in shaping the future of biodegradable orthopedic implants with enhanced biological integration and antibacterial functionalities.

#### Stage of development

**Under development**

#### IPR Status

#### Sustainable Development goals

- **Goal 3: Good Health and Well-being**
- **Goal 9: Industry, Innovation and Infrastructure**
- **Goal 12: Responsible Consumption and Production**

## Partner Sought

#### Expected role of the partner

In this project focused on the development of biodegradable magnesium alloy-based orthopaedic implants using SLM technology, SMEs are actively seeking a strategic partner to play a crucial role in enhancing the functionality and performance of the implants. The identified partner will be integral in the post-manufacturing phase, specializing in coating the produced implants to promote both biological integration and antibacterial surface features. Specifically, we envision a key role for the partner in applying a calcium phosphate-based coating to facilitate mineralization and foster enhanced implant integration within the bone structure. Simultaneously, the partner will explore alternative coating methods, such as incorporating antibacterial agents or nanostructured coatings, to provide an additional layer of defence against microbial threats. Collaboratively, SMEs aim to create a next-generation orthopaedic implant that not only addresses structural requirements through optimized magnesium alloy and lattice production but also prioritizes biological integration and patient safety with advanced and multifaceted surface coatings. Prospective partners with expertise in biomaterial coatings and a commitment to advancing orthopaedic solutions are invited to join us in revolutionizing the field of biodegradable orthopaedic implants.

#### Type of partnership

#### Type and size of the partner

**Research and development cooperation agreement**

- SME <=10
- University
- R&D Institution
- SME 50 - 249
- SME 11-49

## Call Details

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Framework program

**Eureka**

Call title and identifier

**Eurostars call 6**

Submission and evaluation scheme

Anticipated project budget

Coordinator required

**No**

Deadline for EoI

**7 Mar 2024**

Deadline of the call

**14 Mar 2024**

Project duration in weeks

**156**

Web link to the call

<https://www.eurekanetwork.org/open-calls/eurostars-funding-programme-2023-call-6>

Project title and acronym

## Dissemination

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### Technology keywords

- **06001020 - Physiotherapy, Orthopaedic Technology**
- **06001017 - Surgery**
- **06001013 - Medical Technology / Biomedical Engineering**
- **06006004 - Biopolymers**

### Targeted countries

- **World**

### Market keywords

- **05005015 - Orthopaedics**
- **08001018 - Polymer (plastics) materials**
- **05003003 - Surgical implants**
- **08001007 - Coatings and adhesives manufactures**

### Sector groups involved