Strategic projects

SAFERCOAT – A multidisciplinary and circular approach towards the development of innovative, safe-by-design, (bio) degradable multifunctional coatings

48 months: €703.8k (UAveiro €280,6€)

Despite the widespread use of polymeric coatings worldwide, their limited biodegradability and recyclability pose serious environmental and health concerns. The SAFERCOAT project brings together a multidisciplinary consortium of 10 partners from seven countries, including six universities and four industrial partners, to tackle this challenge. Coordinated by Roberto Martins (CESAM & DBio), the project also involves researchers from five departments (DAO, DBio, DFis, DEM, and DEMAC) and four research units (CESAM, CICECO, I3N, and TEMA) at the University of Aveiro, strengthening the interdepartmental and cross-disciplinary collaboration, and the university's commitment to scientific excellence and innovation.

Through the cross-sectoral staff exchange, SAFERCOAT aims to develop innovative, eco-friendly polymeric coatings with enhanced biodegradability at the end of their service life, targeting applications in the aeronautical, maritime, and cultural heritage sectors. The project focuses on synthesizing and modifying thermoplastic and thermosetting polymers to accelerate their degradation at end-of-life, optimizing and validating coating formulations, assessing environmental and health impacts, and upcycling end-of-life materials into value-added products. The project's novelty lies in its use of bio-sourced content and (nano)technologies to create or modify coatings that maintain high performance during use while being highly biodegradable after their service life. By fostering cross-sectoral mobility, knowledge exchange, and training, SAFERCOAT not only advances scientific innovation but also promotes industrial environmental responsibility and strengthens Europe's R&I human capital base. The project's outcomes (e.g., new coatings, eco-designed 3D products) will foster innovation in the polymers industry, establish an international R&D network dedicated to biodegradable coatings, and ultimately contribute to a future with zero pollution.

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement 101182588

More information

https://www.safercoat.eu

https://cordis.europa.eu/project/id/101182588

ALTER-Q: Cr4+:YAG/Polymer nanocomposite as alternative materials for Q-switched lasers: properties, modeling, and applications

48 months, €584,2K (UAveiro €64,4K)

The operation principle of the Q-switched laser is based on the change of Q-factor of the resonator during the laser action. During Q-modulation, the Q-factor initially remains low due to high losses in the optical cavity to suppress generation and store energy inside the laser material. Therefore, the generation threshold and as result the inversion population threshold, are large. The operation principle of passive Q-switched lasers is based on the use of optical (phototropic) materials that change their transparency according to the absorbed energy. However, the properties of suitable phototropic materials for passive Q-switched lasers are not perfect. At the present stage the most popular methods for obtaining Cr^{4+}-doped garnets are based on bulk single crystals, single crystalline films or transparent ceramics technology. However, the main drawback of this approach is complicated technological requirements to the personnel and to the technology itself. Therefore, at the present moment there is demand for the cheapest alternative for Q-switched materials which won't have the drawbacks of transparent ceramics or single crystals technologies.

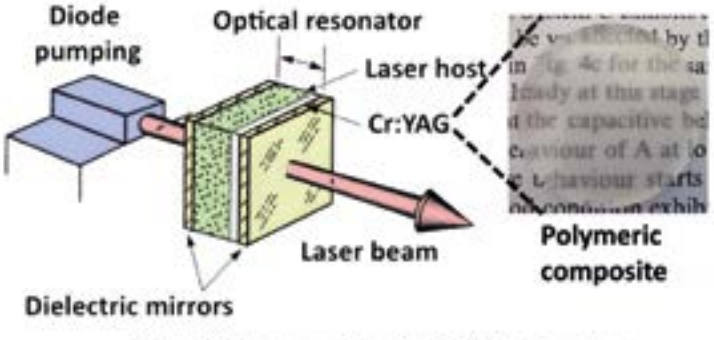
The objective of ALTER-Q, is to develop a new type of passive Q-switched materials based on composite structure of polymer matrix with the Cr^{4+}:YAG nano powders.

The ALTER-Q will focus on several tasks: understanding, predicting and controlling the mechanisms governing spectroscopic properties of Cr4+ ions; development of sintering procedure for preparing Cr4+-doped garnets nanopowders; advancing a methodology to prepare a composite structure of polymer matrices with Cr4+-doped nanogarnets inside; proof of the concept of possibility to develop a new type of Q-switched laser materials based on polymer composite structures with Cr4+-doped garnets nanopowders inside.

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement 101182995

More information

https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/projects-details/43108390/101182995



Proof of the concept of possibility to develop a new type of Q-switched laser materials

NET4MAT: Building knowledge and tools for the sustainable microbial fighting through sensing and responsive polysaccharide-based materials

48 months, €460 K (UAveiro: €155 K)

Plastic pollution and antimicrobial resistance are among the most critical global challenges. The NET4MAT project addresses both by developing biodegradable materials capable of detecting and neutralizing microbial threats, offering safer and more sustainable alternatives to petroleum-derived plastics.

The project is coordinated by Idalina Gonçalves, researcher at the Department of Materials and Ceramic Engineering of the University of Aveiro and CICECO – Aveiro Institute of Materials. Supported by the Marie Skłodowska-Curie Staff Exchanges program, NET4MAT brings together 12 partners from 6 countries in a multidisciplinary and intersectoral consortium that integrates academic research with industrial application.

NET4MAT focuses on the development of polysaccharide-based materials incorporating lanthanide glycoclusters and porphyrinoids. These biofunctional compounds provide the materials with microbial sensing and antimicrobial properties. University College Dublin (Ireland) is responsible for the synthesis of microbial sensing lanthanide glycoclusters. The University of Aveiro leads the synthesis of antimicrobial porphyrinoids and the processing of 3D functional structures. The Spanish National Research Council, Consejo Superior de Investigaciones Científicas (CSIC), contributes expertise in the extrusion of bionanocomposites. The Technical University of Denmark focuses on electrospinning processes, while INP Pagora (France) supports improvements in material processability using nanostructured polysaccharide formulations. The Hebrew University of Jerusalem (Israel) evaluates the antimicrobial activity, biodegradability, and biocompatibility of the materials developed.

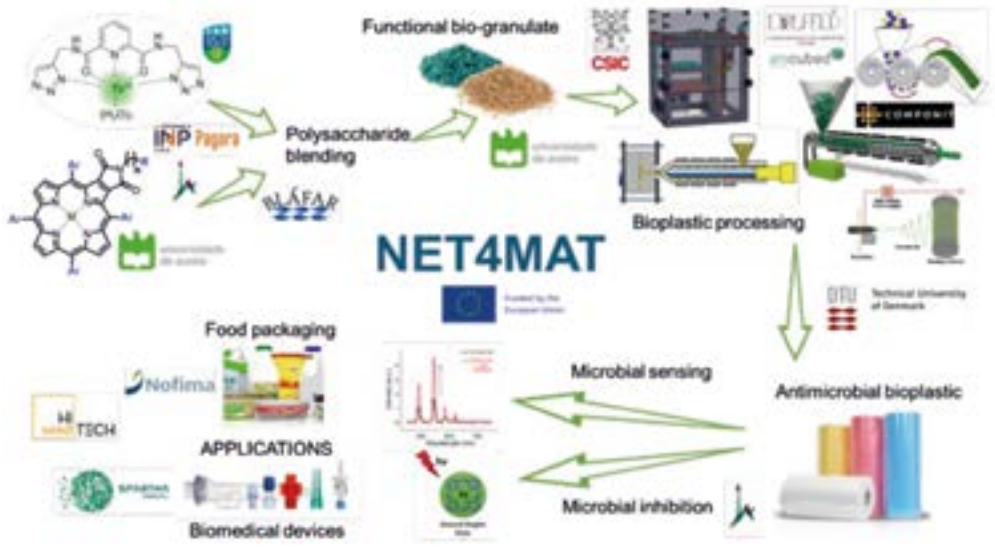
Industrial partners including SPARTHA MEDICAL (France), BLAFAR (Ireland), COLFEED4Print (Spain), and AMCUBED (Portugal) are involved in scaling and application. HISEEDTECH (Portugal), as an associated partner, supports knowledge valorization and entrepreneurship across the consortium.

Aligned with the objectives of the European Green Deal and the Circular Economy Action Plan, NET4MAT aims to deliver prototypes of smart bioplastics for food packaging and medical applications, advancing functional sustainable material technologies in Europe.

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement no. 101131205.

More information

https://cordis.europa.eu/project/id/101131205



SHORES: Exploring sound and music along Europe's shores

24 months, €182,1 K (UAveiro €89,6 K)

SHORES is a Creative Europe cooperation project involving musical creation and collaboration as a tool to raise awareness of the depletion, overuse and contamination that are negatively affecting lakes, rivers and oceans and their interaction with land and humans. SHORES is implemented by a consortium led by the University of Aveiro (Portugal), including as partners the Norwegian University of Science and Technology (Norway), the Vrije Universiteit Amsterdam (Netherlands), and Navalha Associação Cultural (Portugal) as associated partner. SHORES organizes workshops and artistic residencies that will engage both communities and artists, generating creative outputs and events, as well as online resources, that will disseminate the project's contribution transnationally, raising awareness of the problems impacting European shores.

SHORES aims to engage musical practices to raise awareness of fracturing environmental issues and promote sustainable modes of living. SHORES explores, activates and amplifies the artefacts, sounds and musics associated with in-between water and land spaces, as grounds to address goals of sustainability and transnational creation and circulation, encompassing the perspectives of performers/ composers/ sound artists and of local communities. The project partners combine their expertise in artistic research, capacity building and European networking as a connecting platform for environmentally-focused creation and collaboration. SHORES' artistic and dissemination work packages will highlight the relevance of artefact and sound fieldwork collection in shores locations, shared artistic practices, and capacity building and learning by artists and communities for participative sound/ music creation and performance.

This project has received funding from the European Union's Creative Europe programme under the grant agreement 101173637

More information

https://shores.pt/

TERRASAFE & TERRASAFE.PT – TErrestrial Resilience and RestorAtion Strategies for (semi) Arid and Fragile Ecosystems through a multi-actor Approach

60 & 36 months, €6,5M (UAveiro: €732K) & €311K (UAveiro: €248,9K)

TERRASAFE is one of two projects that is being funded under the Soil Mission Call topic "Innovations to prevent and combat desertification" (HORIZON-MISS-2023-SOIL-01-04), with co-funding of UKRI for its two UK partners. TERRASAFE.PT is a "child" project of TERRASAFE, funded by the La Caixa Foundation under the program "Promove. O futuro do interior 2024", to apply TERRASAFE's approach to a desertification-prone pilot area in Portugal and adapt it to the needs and opportunities of AFLOBEI's associates (Forest Producers Association of Beira Interior). Both projects are the most recent exponents of a long-standing research tradition at the University of Aveiro into environmental and socio-economic aspects of desertification, initiated and long-led by Professor Celeste Coelho of DAO, including through EU-funded projects such as MEDCHANGE (1997-2000) and MEDAFOR (1998-2001).

TERRASAFE has as overarching aim to empower local communities in southern Europe and northern Africa to confront the growing threats of desertification. To this end, TERRASAFE envisage a multi-actor approach in which the project partners support five contrasting desertification-prone communities to develop, implement, evaluate, demonstrate, disseminate, and promote the widespread adoption of innovative nature-based, technological and social solutions. A distinguishing aspect of TERRASAFE is, arguably, that its innovations are commercial solutions that are close-to or already on market. "TERRASAFE-certification" of the environmental effectiveness and economic viability of (some of) these solutions through field trials is foreseen to support ambitious future business plans of the "innovation partners". A second pathway for impact is envisaged to be the uptake by other communities of TERRASAFE's methodological frameworks for stakeholder engagement, analysis of desertification status and trends, innovation impact assessment, development of policy recommendations, and cross-community collaboration.

These projects have received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement 101157373 and Fundação La Caixa, under the programme Promove

More information

https://terrasafe.eu & https://www.cesam-la.pt/projetos/terrasafe-pt-terrestrial-resilience-restoration-strategies-to-combat-desertification-in-portugal/