

# EU Awards €8 Million to Advance Solar Fuel Technologies through Solar to Butanol (S2B) and SUN-PERFORM



## Bio-inspired technologies aim to revolutionize renewable fuel production for hard-to-electrify sectors

The European Commission has awarded a combined €8 million in Horizon Europe funding to two groundbreaking projects that could transform how we capture and convert solar energy into liquid fuels. SUN-PERFORM and Solar to Butanol - S2B aim to develop highly efficient bio-inspired technologies that could significantly reduce Europe's carbon emissions while creating new green industry opportunities. These innovative approaches specifically target hard-to-electrify sectors like aviation and shipping, where traditional renewable solutions have struggled to make significant inroads.

The projects have been funded under the Horizon Europe call HORIZON-CL5-2024-D3-01-04, which supports the development of advanced biochemical, bio-inspired, or biomimetic approaches to significantly enhance light harvesting and carbon fixation. The goal is to accelerate the conversion of solar energy into high-yield, cost-effective fuel molecules. The initiative targets advanced solar fuels other than hydrogen, focusing on scalability, sustainability, safety, and economic viability, integrating seamlessly with existing solar technologies and broader renewable energy systems. Both initiatives will run for 4 years, with demonstration results expected by 2028.

## SUN-PERFORM: Bio-Nano Synergy to Maximize Light Conversion

Coordinated by Wageningen University in the Netherlands, SUN-PERFORM ([sunperform.eu](https://sunperform.eu)) is developing innovative biohybrid technologies that combine advanced nanocrystals—designed to maximize light capture—with genetically engineered microalgae optimized for solar fuel production. The aim is to improve solar-to-fuel conversion efficiency fourfold, making it suitable for scalable, industrial applications. “With SUN-PERFORM, our aim is to contribute effectively to solving challenges in hard-to-electrify sectors such as aviation and maritime shipping—areas where sustainable fuel alternatives are most urgently needed,” says Dr. Sarah D’Adamo, Project Coordinator and Assistant Professor at Wageningen University.

The SUN-PERFORM consortium comprises top research and industry partners, including Wageningen University (Netherlands), Universität Bielefeld (Germany), Politecnico di Torino (Italy), IN SRL Impresa Sociale (Italy), Universiteit van Amsterdam (Netherlands), SolarFoil BV (Netherlands), and the Max Planck Society (Germany). Real-world testing will occur at demonstration facilities in the Netherlands and Morocco, with the Moroccan site chosen specifically to test the technology performance in high-solar-intensity environments.



## Solar to Butanol – S2B: Next Generation Solid-State Photosynthetic Cell Factories

S2B, coordinated by the Turun yliopisto-UTU (Finland), focuses on direct conversion of solar energy and atmospheric CO<sub>2</sub> into butanol – a renewable fuel - using genetically engineered photosynthetic microbes and advanced nature-based (nano)materials. The consortium is developing solid-state photosynthetic biocatalysts by 3D printing hybrid films that embed photosynthetic cells within functional hydrogel-based materials. These long-lived, sustainable bioproduction platform aim to significantly improve light-to-fuel conversion, CO<sub>2</sub> fixation efficiency. “S2B is creating nature-inspired technology that is not only efficient, but also cost-effective and scalable” explains Professor Yagut Allahverdiyeva-Rinne, the consortium’s coordinator.

Partners include 7 leading research entities and one innovation consulting company across Europe: University of Turku/Turun yliopisto - (Finland), Nantes Université (France), Kungliga Tekniska högskolan – KTH (Sweden), Åbo Akademi (Finland), Stichting VU (Netherlands), Universiteit Twente (Netherlands), Lappeenranta–Lahden teknillinen yliopisto - LUT (Finland) and ERDYN Consultants (France). The S2B project will develop prototype devices at TRL4-level, with demonstration sites located in Turku (Finland), and Nantes (France).

### Shared Vision, Complementary Approaches

Both SUN-PERFORM and Solar to Butanol – S2B exemplify Europe's dedication to a fossil-free future and the development of innovative solutions for clean energy and sustainable fuel production. Both projects are grounded on photosynthetic principles and share the common goal of advancing solar fuel technologies, improving sustainability, and enabling scalable solutions.

While SUN-PERFORM focuses on producing key lipids (TAGs), which can be converted into biodiesel or sustainable aviation fuels through established processes, S2B targets the direct synthesis of drop-in fuel butanol.

Together, these pioneering projects mark a significant step toward realizing the European Union’s vision for a climate-neutral future, accelerating the transition to sustainable solar-driven fuels through scientific excellence and cross-border collaboration.

S2B website: <https://www.s2b-project.eu/>

SUN-PERFORM website: <https://sunperform.eu/>

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