

SoFiA – Using Soap film as a Membrane for Artificial Photosynthesis

Uppsala University Ångström Lab leads a FET-OPEN project awarded with a €3.2 million grant by the European Commission.

- Project SoFiA: "Soap Film based Artificial Photosynthesis" receives funding from the FET OPEN 2018 call within the Horizon 2020 program.
- SoFiA aims to build a bench scale demonstrator device that will be able to produce sustainable solar fuels and feedstock for chemical industries using exclusively sunlight, water and CO₂.
- The SoFiA concept bio-mimics the thylakoid membrane in leaves and uses surfactant class molecular catalysts made from earth abundant materials, to form self-assembled photo catalytic surfaces with designed soap foam.
- Coordinated by Prof. Leif Hammarstrom from Uppsala University, the interdisciplinary project features 8 partner institutions from 6 different countries. SoFiA will start from 1st January 2019 and will last 48 months.

The world's energy demand is expected to double by 2050. We need clean energy, and a potential solution is given by the sun. The best way to store solar energy in large amount and for a long time is through fuels, which are 1-2 orders of magnitude more energy dense than the best batteries.

Artificial Photosynthesis (AP) represents a scheme for capturing and storing the vast energy from sunlight in chemical bonds of a solar fuel. The World Economic Forum 2017 listed "Fuels from Sunlight" as no 4 of top emerging technologies. Today, AP is regarded as a global socio-political & environmental game changer and is explicitly supported by the European Commission (EC) through The European Energy Research Alliance Joint Program "Advanced Materials & Processes for Energy Applications". The latest project to be funded in this context by European Commission, is SoFiA – Soap Film Based Artificial Photosynthesis.

SoFiA approaches a scientific solution through biomimicry of the thylakoid membrane in leaves using designed soap films containing soap/surfactant class molecular catalysts made from earth abundant materials. SoFiA then approaches an engineering solution by biomimicry of trees performing natural photosynthesis with leaves, using innumerable renewable surfaces created by constantly regenerating soap foam.

Project manager Dr. Indraneel Sen pointed out: "SoFiA bridges distant scientific disciplines with business management, environmental & socio-political sciences, and fine arts." SoFiA intrinsically crosses traditional collaborative boundaries, bridging for the first time, mutually exclusive disciplines of surfactant science, solar fuels, and fundamental science of water at nanoscale - initiating their mutual learning, cross-fertilization and synergistic advances.

SoFiA consortium features 4 leading European universities (Uppsala University, University of Cambridge, University of Leiden, Politecnico di Torino), 1 European research institute (NWO-I AMOLF), 1 international research institute (UNESCO-ICTP) and two European SME (Teclis Scientific, Microfluidic ChipShop). The final objective of the consortium is the validation of a prototype capable of transforming CO₂ into fuel and renewable feedstock for industry, in a sustainable and cost-efficient way.

About the Angstrom Lab at Uppsala University:

Uppsala University (UU) is consistently ranked among the top 100 universities in the world. The Ångström Laboratory is a leading research centre for materials, physical sciences and engineering. It has delivered World leading research in solar cells, solar fuels, batteries, wave power, and energy materials.

SoFiA coordinator: Prof. Leif Hammarström, is an experienced research leader and supervisor, and is chairman of the Swedish Consortium for Artificial Photosynthesis (CAP). CAP center at UU was ranked as “world-leading” in 2011 by an international panel led by Prof. Peter Stang, main Editor of J Am Chem Soc. - “[it] represents the standard against which many efforts around the world are either directly or indirectly compared.”. He is a frequently invited international speaker and has published >180 papers. He is an elected member of the Royal Society of Sciences.