Sunflower

printed organic photovoltaic cells

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Organic photovoltaics (OPV) represent the newest generation of technologies in solar power generation, offering the benefits of flexibility, low weight and low cost enabling the development of new consumer nomadic applications and the long term perspective of easy deployment in Building Integrated Photo Voltaics (BIPV) and energy production farms. This is a key opportunity for the EU to further establish its innovation base in alternative energies. The current challenges reside in the combination to increase **efficiencies to 8-10% (module level)**, increase expected **lifetime up to 20 years** and decrease **production costs to 0.7 Eur/Wp**, while taking into account the **environmental impact and footprint**.

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SUstainable Novel FLexible Organic Watts Efficiently Reliable

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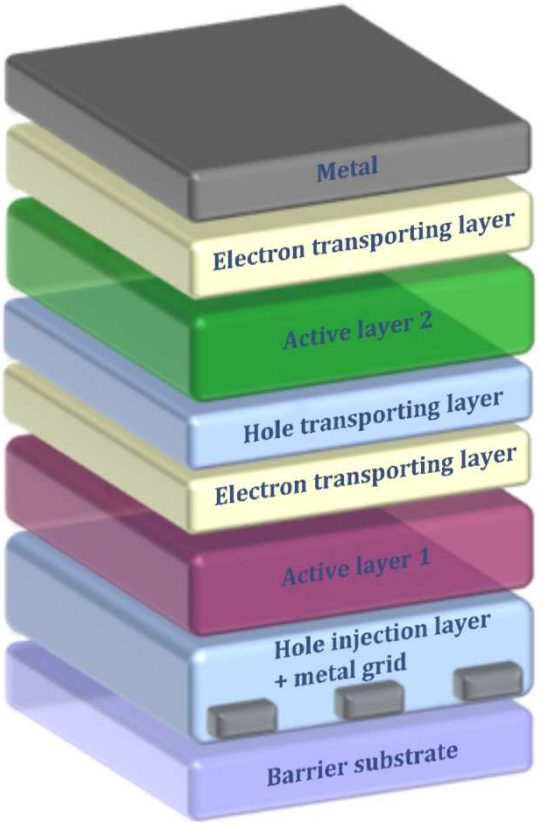

Key Project Objectives:

- ➔ Printed OPV with **high efficiency** architectures such as tandem cells and dedicated light management structures
- ➔ **High performance** photo active and passive (barrier) materials including process controlled morphology
- ➔ Solutions for **cost effective** flexible substrates, diffusion barriers and conductors
- ➔ Deep understanding of the **device physics**, elucidation of **degradation mechanisms** and estimate of the **environmental impact** of the main materials and processes

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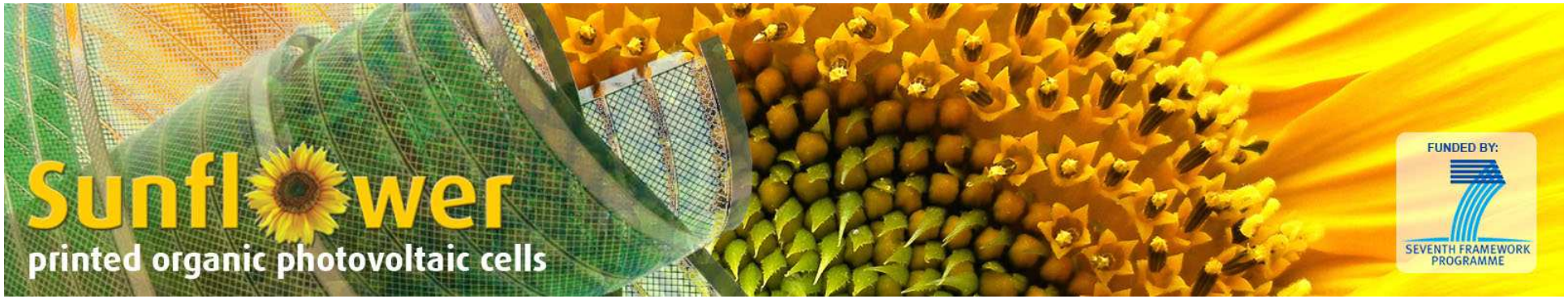

Materials / Formulation → Fundamental Mat. science → Devices/ Module / Processing → Lifetime /Eco impact /

The project consortium combines industrial, institutional and academic support to make a significant impact at European and International level, especially on materials and processes while demonstrating their market-relevant implementations. The industrial project partners are well assembled along the supply chain of future OPV-based products: an important prerequisite for the creation of a significant socio-economic impact..

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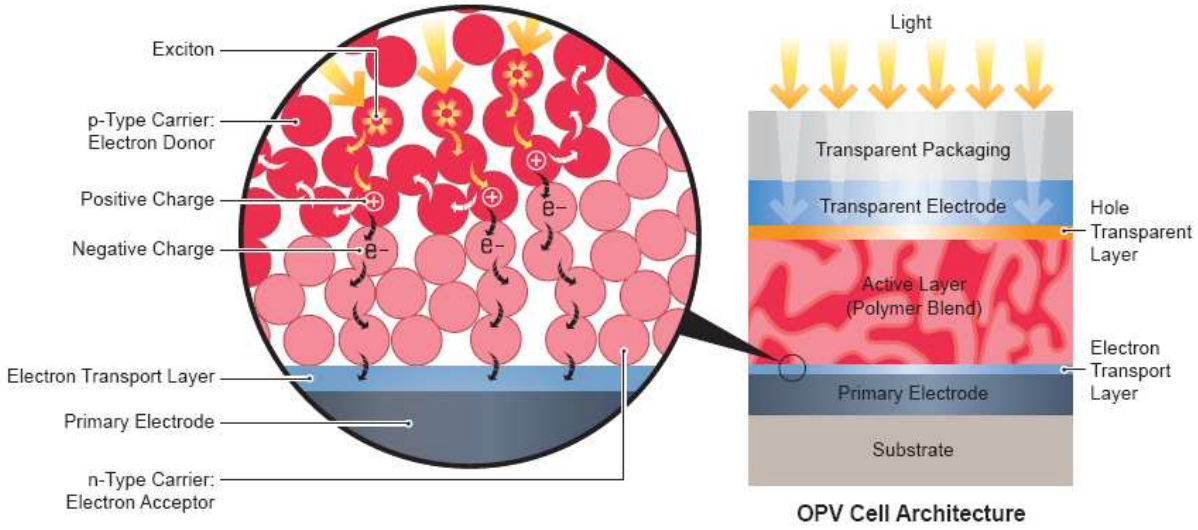
Organic photovoltaics

The newest generation technology in solar power generation



OPV Cell Architecture

Benefits

Renewable energy, low CO_2 footprint, highly automated, low energy consuming and cost effective roll-to-roll production through printing, novel form factor

Opportunities (for EU)

Expand the innovation base in alternative energies

Develop manufacturing technologies : high level of automation, highly trained personnel, low energy consumption and close proximity to suppliers and markets

Challenges:

Efficiency, lifetime, costs

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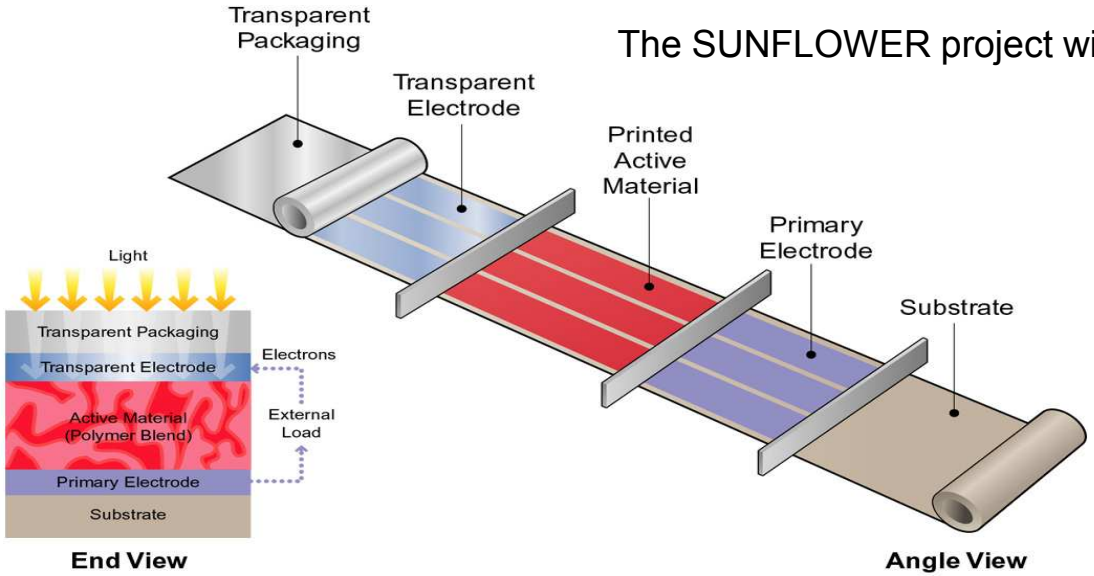
Project rationale



The SUNFLOWER project will develop along the following guiding lines

High module efficiency *to be competitive with other photovoltaic (PV) technologies*

Multilayer structure ("tandem") *to achieve high efficiency*

Cost effective barriers and getters *to achieve long lifetime*

Roll-to-roll atmospheric printing processes *to lower costs [where costs include fabrication (Eur) and environmental impact ($kgCO_2$)]*

Replacement of rare inorganic components such In, Te, and Cd *to enable sustainability*

Development of basic/applied science for photoactive materials *to enable efficient & stable modules*

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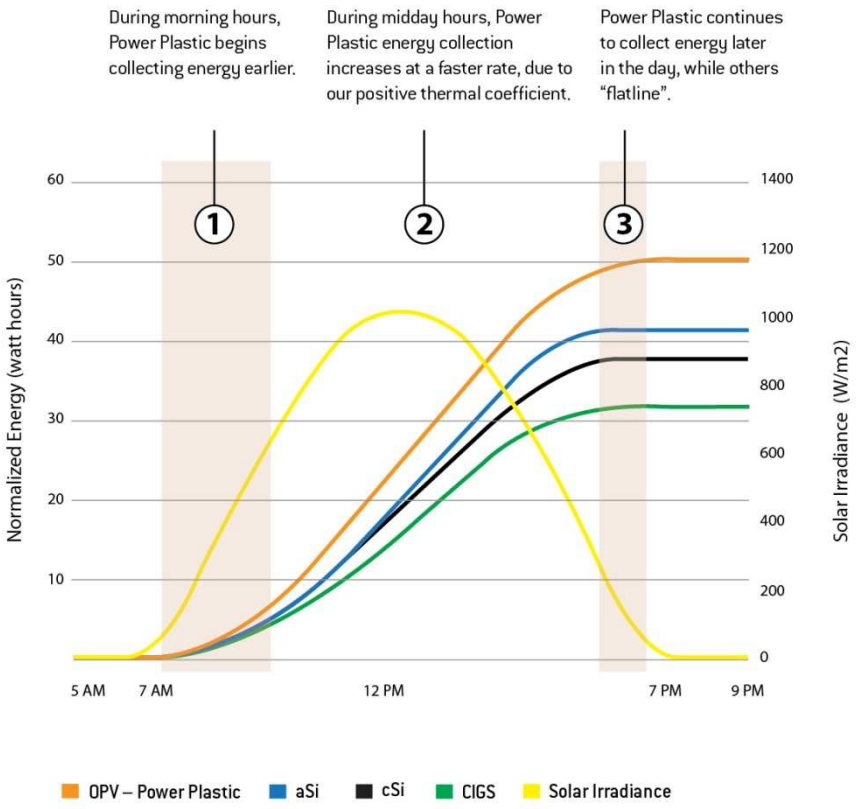
Comparison to other PV technologies: Energy performance of 5 Wp modules



20% - 55% superior OPV performance than Wp predicts
(greater performance in low intensity, low angle, and diffuse irradiance)

Positive thermal coefficient

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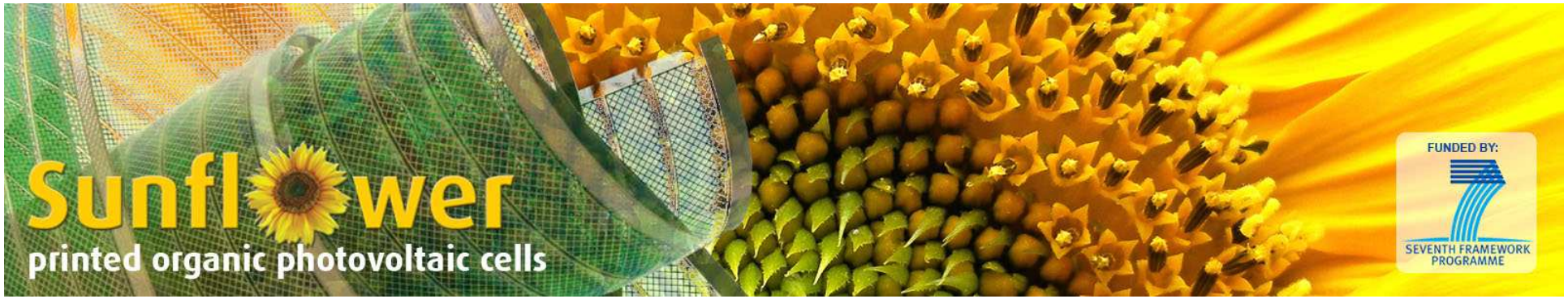

Project goals and innovation impact

≥ 8-10% mod.

- Material development (polymers and nanoparticles, interlayer materials)
- Morphology control
- Novel device architectures (tandem cells)
- Device physics and advanced analytics (minimization of losses)
- Light management structures (transparent electrodes, anti-reflection layers)
- Efficiency (PEDOT+Ag)
- Upscaling overview

≥ 20 years

- Packaging and stable films
- Degradation studies (correlations and extrapolations)
- Improved interface materials
- Weatherable films (novel additives, encapsulation, optimization)
- Analysis of Life-Cycle-Aspects and sustainability requirements

≤ 0.7€/Wp

- Printed transparent electrodes (PEDOT+Ag)
- Tools for mass manufacturing
- Efficient production techniques (roll-to-roll)
- Controlled environmental impact
- Cost effective barrier production

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Project outcome & exploitation plan

- **OPV module production**: the large presence of industrial partners in the consortium (50%) ensures an enhanced level of competiveness of the entire supply chain represented in SUNFLOWER.
- **Materials**: active polymers/nano-inks, UV stable substrates & barrier materials (supplied internally in the SUNFLOWER consortium and outside). Large part of the value chain resides in Europe based materials suppliers.
- **Enabling tools**: standards and testing methodology, environmental & sustainability analysis, simulation software, metrology equipment.

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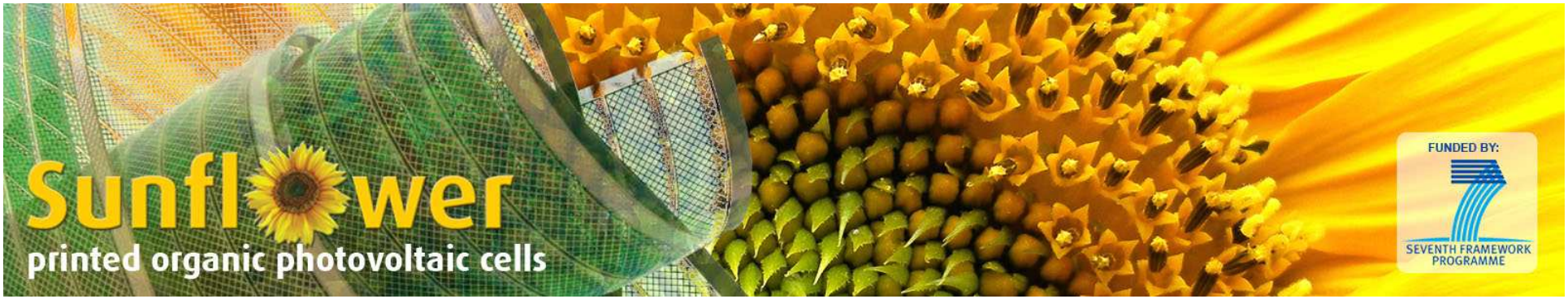

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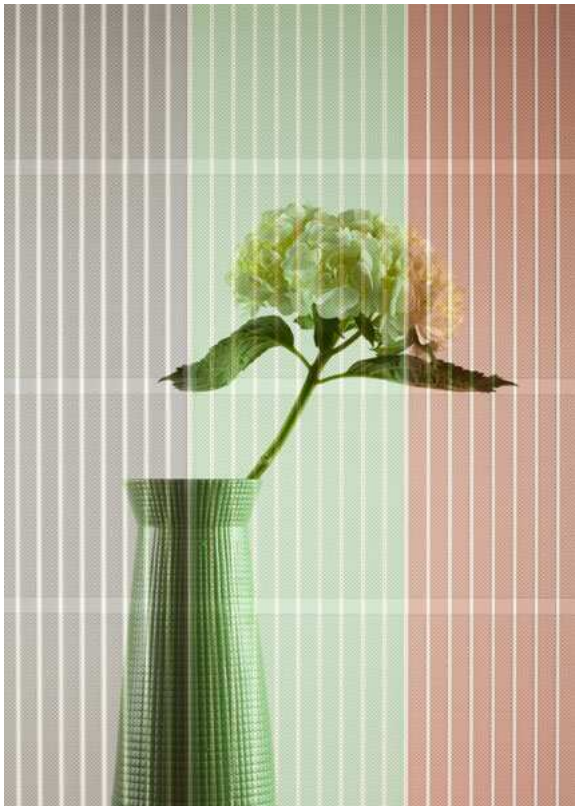

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www.csem.ch

http://cordis.europa.eu/fp7/ict/photonics/projects-fp7_en.html

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