White or colored: finally photovoltaic gets 100% building integrated
Company presentation

• Swiss company founded in January 2015 in Neuchâtel
• Currently consists of 5 employees
• Leader in colored PV: white, gray, beige...
• Holds 3 patents of the white PV technology for 20 years
• First projects currently being installed
• Sales pipeline growing
Façades become active and beautiful

- Our films enable PV module manufacturers to provide architects, developers and ultimately owners with white or light-coloured active full-building elements that are cost effective, durable and aesthetically pleasing.

- This allows architects and designers to integrate PV modules with unlimited colours within one building concept. They can incorporate renewable energy into their design without compromising their aesthetic vision.

These new active facades will become an essential part of the building enveloppes in the years to come
Recent prizes & awards

Zürich Climate Prize Switzerland
(Category Buildings & Housing)

Tapping new potentials with white photovoltaic modules

Photovoltaic modules often appear alien on buildings. With a new kind of coating, they can be produced in the needed-based colors that can be optically integrated.

The start-up from Neuchâtel uses patents of the Centre Suisse d’Electronique et de Microtechnique (CSEM) for a nanotechnology coating which allows producing PV modules in any color. The walls and windows, today typical f or PV modules, become invisible, the surfaces homogeneous. In particular white PV modules constitute a major breakthrough, because they tap huge potential as regards additional surface areas for solar power.

Entire facades can in the future be fitted with photovoltaics with the benefit of substituting huge quantities of CO2 with renewable energies.

The decision of the Jury

The Jury honours the fact that the new coating significantly broadens the area of application for PV modules. By using PV modules on clearly visible facades it switches from an addition to a construction material.
Our technology acts as a selective mirror that *reflects visible light and transmits infrared rays*.

This allows PV modules (c-Si or CIGS based) to appear white to the human eye, yet retain excellent power output.

Solaxess owns 3 exclusive licenses of CSEM (Swiss Center for Electronics and Microtechnology) patents.
Efficient spectral selectivity

Typical EQE of existing c-Si based solar cell technologies

- Polycrystalline
- Monocrystalline
- PERC
- Heterojunction

Visible range
Near infrared-range

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Efficient spectral selectivity

Typical EQE of existing c-Si based solar cell technologies

100 Wp/m²

Solaxess white film transmission
Efficient spectral selectivity

Typical EQE of existing c-Si based solar cell technologies

Solaxess gray film transmission

Visible range

Near infrared-range

130 Wp/m2

Polycrystalline
Monocrystalline
PERC
Heterojunction
Visual appearance

Cells and metallic ribbons are fully hidden

Before

Now
Solar goes white

PV modules that look like standard construction materials

ESB - Jardin des Énergies
Solar goes white

PV modules that look like standard construction materials

- Solar energy becomes invisible.
- Optically homogeneous façades - activated or not.
- All sizes of modules are possible.
- Matt aspect similar to regular façades and the cells remain invisible.

Power and temperature monitoring station
Current Solaxess status

→ Large-scale production is starting now

• Pre-production film was validated on large scale modules
  • Large 1.67 m wide films provide architectural design freedom
  • Very stable during the lamination process of large modules, very low-shrinkage
  • Solaxess provides recommendation and full support for the first trials with the film

• First orders have just started
  • First projects are currently being manufactured
  • First small façade (30 m2) to be presented in February 2018 (check our website)
  • Many larger projects are already planned for this upcoming year

• White film available in stock
  • Gray films available in April 2018
  • 5 additional basic colors are expected to be available later this year
  • Exclusive color can be developed depending on project size
Simple integration into PV modules

Integration process is illustrated in the graphic below:

- To obtain the best possible performance and reliability, our films are simply added on top of standard PV modules during the lamination process.
- Both glass/backsheet and glass/glass configurations are supported.
- We currently recommend the use of ETFE frontsheet protection for our film (mat or brilliant) → ETFE is a proven material for large architectural projects.
Our commercial strengths

• Exclusive technology, patented and usable by any PV module manufacturer.

• Simple logistics can be delivered worldwide - just a few rolls will cover 10’000 m²

• Flexibility, can be adapted to any size and shape required by the design

• Any bright color can be manufactured
Typical white PV façade power output

• The typical power output of a PV module with our most vivid white film is around 100 Wp/m²:

<table>
<thead>
<tr>
<th>Color</th>
<th>Power Output (Wp/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>170</td>
</tr>
<tr>
<td>Light grey</td>
<td>121</td>
</tr>
<tr>
<td>Standard white</td>
<td>117</td>
</tr>
<tr>
<td>Vivid white</td>
<td>106</td>
</tr>
</tbody>
</table>

Values obtained with 156 x 156 mm² mono-crystalline PERC c-Si cells under STC.

• Higher powers are obtained with darker tones, since brighter appearances require more visible light to be reflected. Any color can be developed to match the project design.

• Conventional passive façade elements made of plaster, aluminum, marble or other materials can finally be replaced by active PV building elements.
Reduced temperature

- The film reduces the module’s operating temperature.
- A reduction of around 14°C was measured at the back of the module when the outdoor temperature was 25°C in Switzerland.
- Compared with standard black PV modules, this temperature reduction leads to:
  - A better relative performance in real conditions, particularly in warm climates.
  - Reduced building air conditioning needs.
White or colored, photovoltaics become 100% building integrated
White or colored, photovoltaics become 100% building integrated

New regulations for energy efficient building renovations

- The former Post Office administration building in Ouchy-Lausanne was completely renovated in 2013.

- If this building had been renovated in 2018, it would produce 132 MWh per year – enough to power 35 family homes – thanks to our technology.
PV as an integrated building material
At last, photovoltaics become 100% building integrated

Thank you for your attention