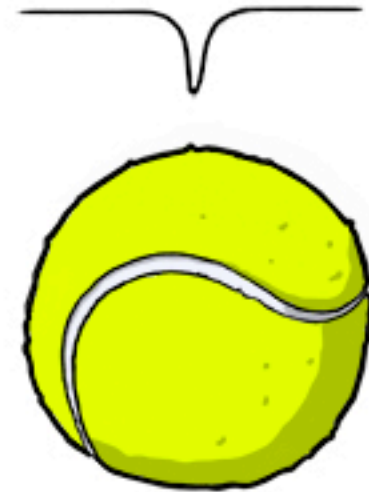
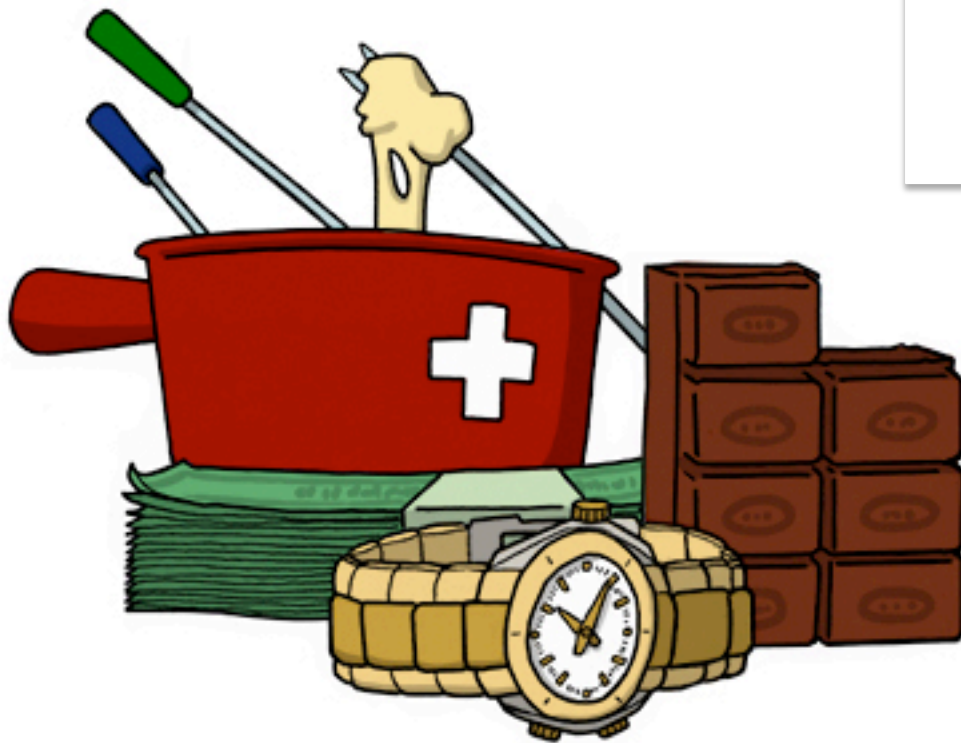


“When PV modules are becoming real building elements: White solar module, a revolution for BIPV”

Laure-Emmanuelle Perret-Aebi

Hello.  
This is the  
place to go for  
Swiss “clichés”?







# Photovoltaic Research

A competence center



- Basic research
- Advanced devices
- Thin film, c-Si
- Reliability model



- Applied research from lab to industry
- 22% cells
- Modules prototyping, extrusion
- BIPV, specialty products



EPFL- PVLAB



**CSEM PV-center ( since 2013)**

# Photovoltaic in buildings

An incredible potential

In Switzerland, 30% of our electricity needs would be covered by using PV modules (10% efficiency) on well oriented roof (130km<sup>2</sup>)



# Photovoltaic in buildings

An incredible potential

- Positive energy buildings
- MoPEC 2014

In Switzerland, 30% of our electricity needs would be covered by using PV modules (10% efficiency) on well oriented roof (130km<sup>2</sup>)



# Photovoltaic in buildings

Integration & Aesthetic

Switzerland: a country of innovation??





# Photovoltaic in buildings

Integration & Aesthetic

## Integrated «Megaslates»



# Photovoltaic in buildings

Integration & Aesthetic



# Photovoltaic in buildings

Integration & Aesthetic



# Photovoltaic in buildings

Integration in cities



# Photovoltaic in buildings

some numbers

Wood: 150 CHF/m<sup>2</sup>

Ceramic: 250 CHF/m<sup>2</sup>

Metal: 300 CHF/m<sup>2</sup>

Glass: 600 CHF/m<sup>2</sup>

Marmor: 1000 CHF/m<sup>2</sup>

**Micromorph PV module: 90 CHF/m<sup>2</sup>**



# Photovoltaic in buildings

A multidisciplinary challenge

- Attractive dedicated modules designed with architects, builders, installers...

colored modules,

optical effect,

size, shape, dummies

- Multi-functional building elements

building skin,

insulation, ventilated façade,

windows.

# Photovoltaic in buildings

A multidisciplinary challenge

But also...

- Identification of the operational barriers
- Holistic strategies - from industry to implementation
- Legislations and regulators, architects, suppliers, integrators, builders...
- Cultural, societal, emotional barriers

# Photovoltaic in buildings

Nice and at low cost

Transforming and modifying a standard PV module without touching the core technology is a efficient way to modify overall aesthetics without increasing the module costs.



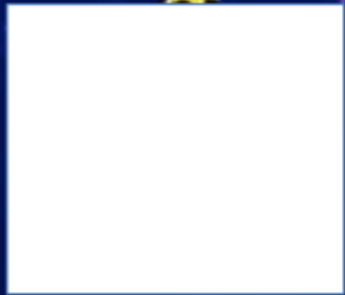
White is a dream...

# Architecture & Energy

Integration & Aesthetic

The dream of an architect...

Please draw  
me the  
perfect solar  
module..



facebookcovers.biz

# White photovoltaic module

for building facade

Cool & fresh



Elegant



Fits to any architectural style





# White photovoltaic module for building facade

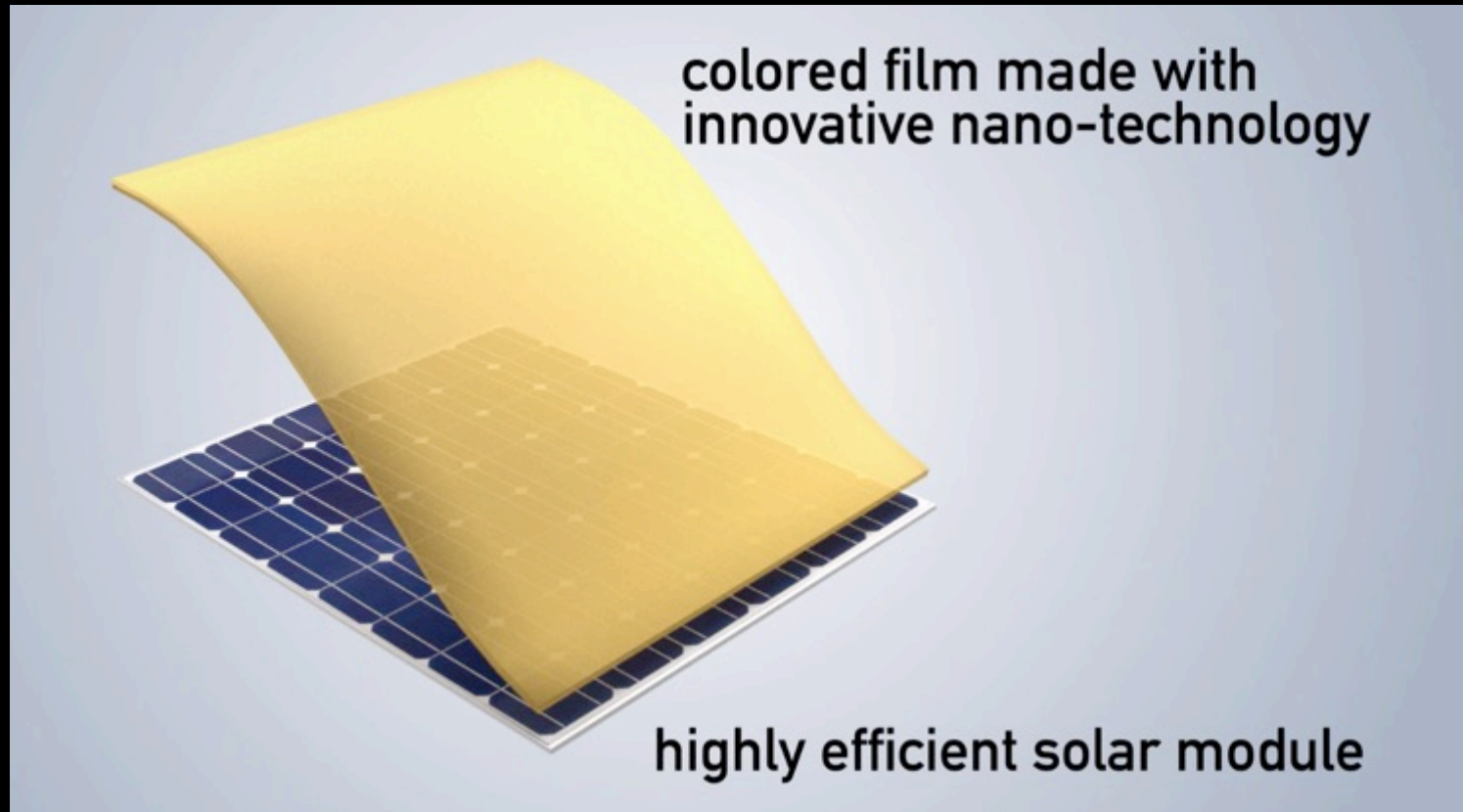


First prototypes at 10% efficiency



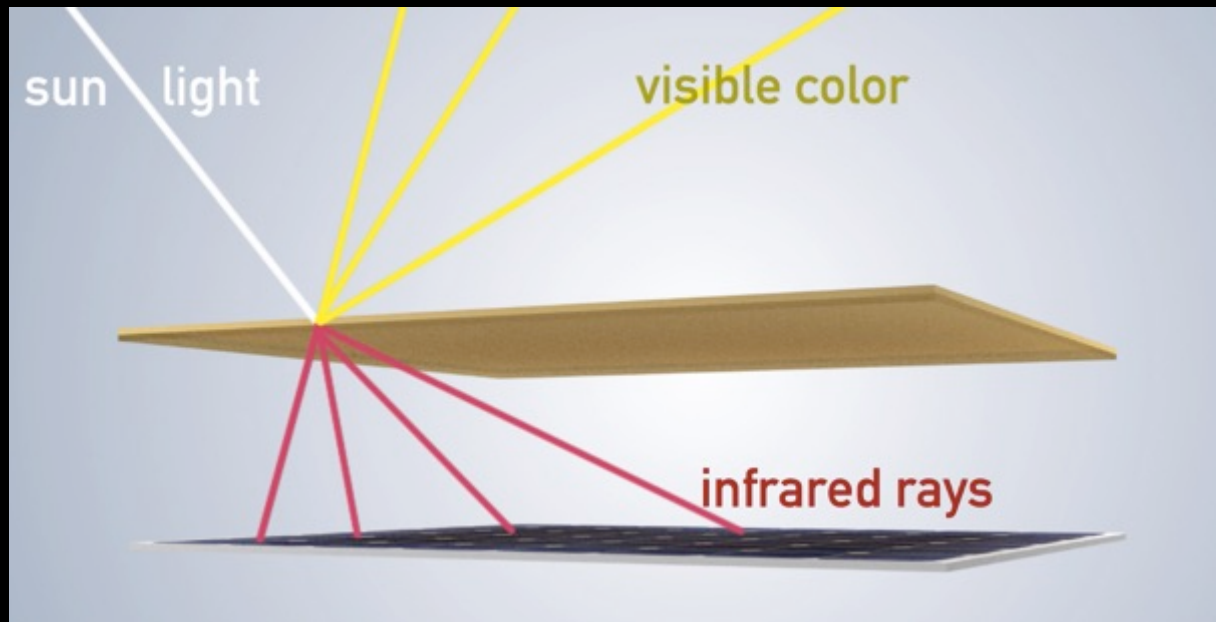
# White photovoltaic modules

How does it work



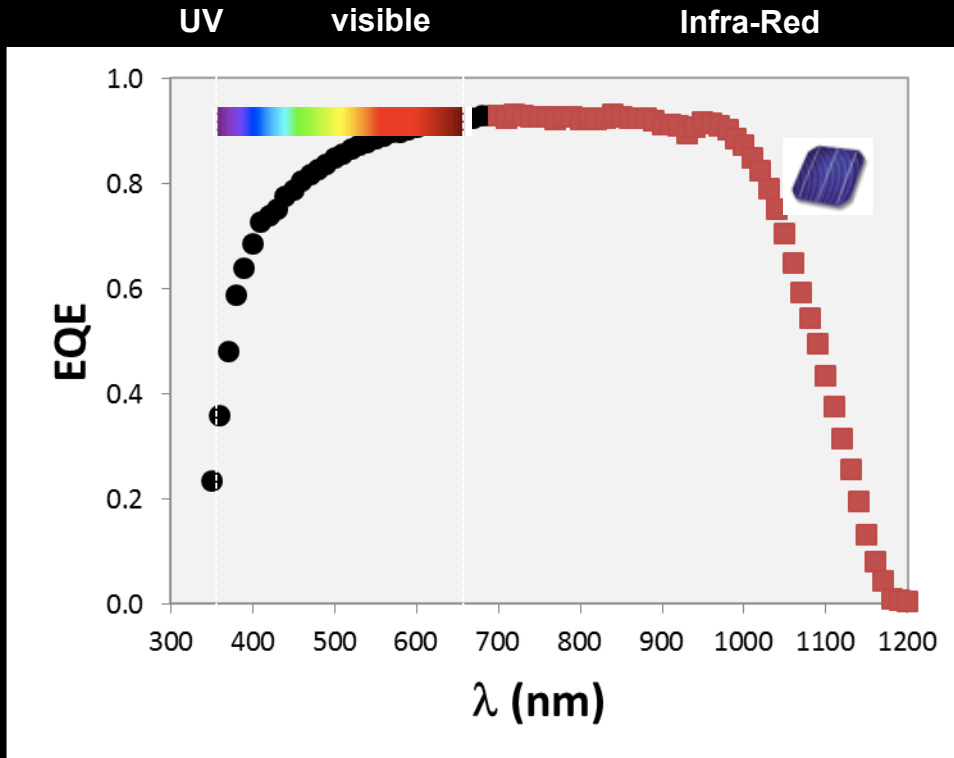
# White photovoltaic modules

How does it work

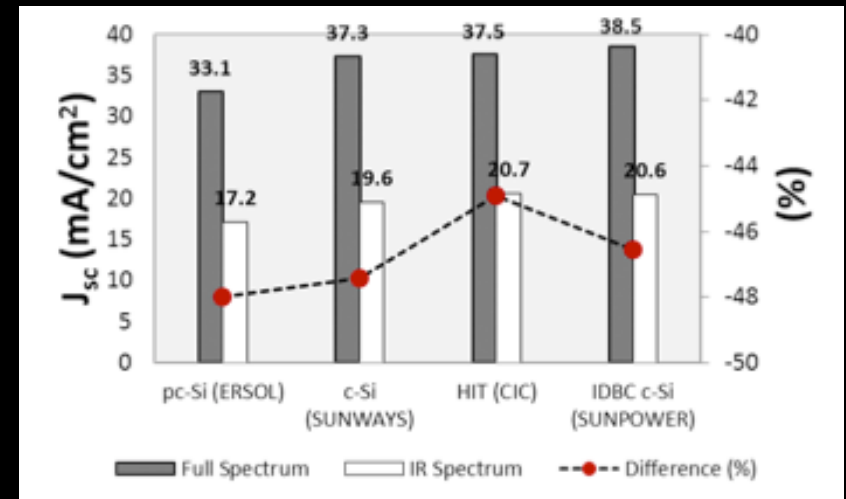


# White photovoltaic modules

How does it work



IR response for different silicon solar cells technologies



- HIT solar cells have a particularly high response in the IR part of the spectra
- 55% of its current comes from IR (700-1200nm).



# White photovoltaic modules

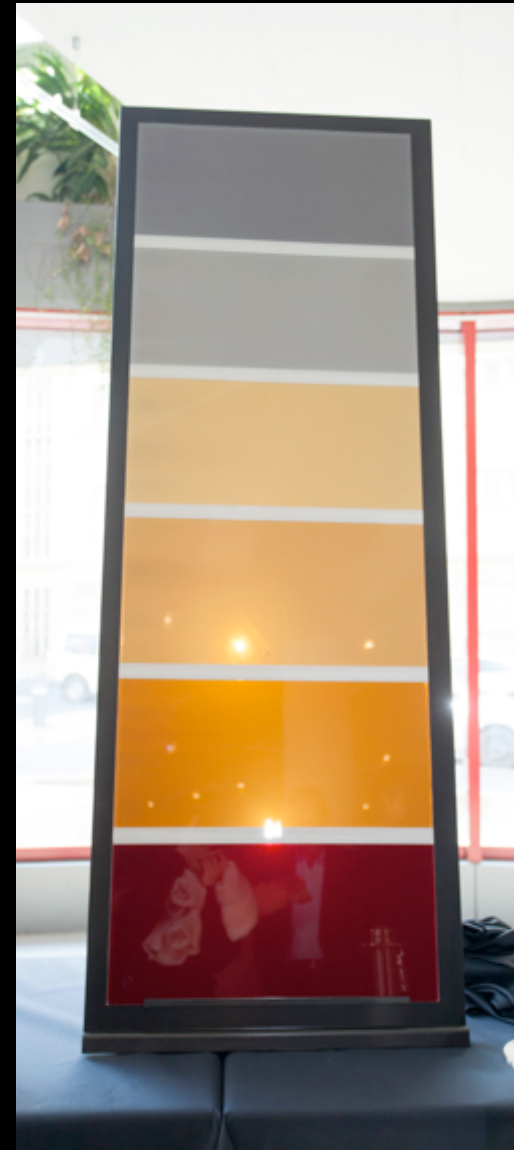
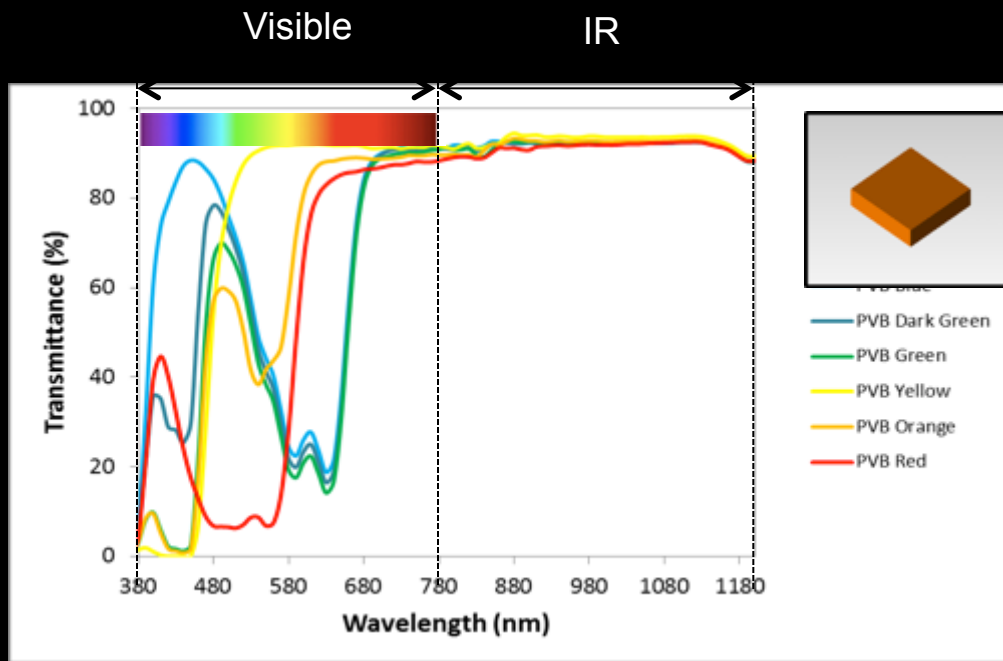
from lab to fab

**SOLAXESS**  
white solar technology

[www.solaxess.ch](http://www.solaxess.ch)

# Colored photovoltaic modules

Next step



# Colored photovoltaic modules

Next step

Choose your own design!



# White photovoltaic modules

A new building material



From inactive to active building façade!!

# Thank you for you attention



Swiss PV flag at 10% efficiency