

# PRESS RELEASE

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## Aesthetic and efficient facades: Fraunhofer FEP presents advances in building-integrated photovoltaics

**As part of the Design-PV project, Fraunhofer FEP has made significant progress in developing aesthetically appealing solutions for building-integrated photovoltaics. Technologies such as roll-to-roll nanoimprint lithography enable solar modules to be seamlessly integrated into building facades without compromising the design. Initial tests show that the modules are visually indistinguishable from conventional facade elements yet offer high energy efficiency.**

Photovoltaics are a key pillar in achieving the goal of climate neutrality by 2045. Building-integrated photovoltaics (BIPV) offer a way to use previously unused space for energy production. However, to increase the acceptance and spread of BIPV, PV modules must be cost-effective, durable, and visually appealing when integrated into the facade.

This is precisely what the Design-PV project, funded by the German Federal Ministry for Economic Affairs and Energy, is working on. Together with five partners, Fraunhofer FEP is developing decorative films for facade elements that are finished using roll-to-roll nanoimprint lithography (NIL). The aim is to achieve a uniform design on metal facade elements and photovoltaic modules by applying the decorative films to these elements. At the halfway point of the project, several designs from project partner Surteco GmbH were applied by Institute for Solar Energy Research in Hamelin (ISFH) to PV-active and non-active facade elements and tested.

“Tests carried out by project partner ISFH show that the PV modules with decorative finishes are visually indistinguishable from conventional facade elements and, depending on the finish, achieve up to 80% of the performance of uncovered comparison modules,” says Dr. Steffen Günther, project manager at Fraunhofer FEP. This represents a significant step forward, as aesthetic aspects are often seen as an obstacle to the acceptance of BIPV solution.

A particular challenge in the project is the adhesive strength of the decorative films on the front glass of the PV modules and on the metal layer of the facade elements. In addition, the decorative coating must adhere reliably to the ETFE (ethylene tetrafluoroethylene) film substrate, which is already established in architecture due to its excellent weather resistance. However, since ETFE has low surface adhesion, the films must be specially treated before coating. Fraunhofer FEP has developed a plasma process for

Funded by the German  
Federal Ministry for  
Economic Affairs and Energy.  
Funding reference: 03EN1084A



Federal Ministry  
for Economic Affairs  
and Climate Action

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this purpose that roughens the interface layer of the ETFE film on a nanometer scale, thereby significantly improving the adhesion of the decorative layers.

The next steps in the project include testing additional designs and colors, as well as comprehensive tests on the long-term stability and weather resistance of the developed solutions. Fraunhofer FEP and its project partners are confident that these advances will contribute to further increasing the acceptance of BIPV solutions in architecture.

Project manager Dr. Steffen Günther will present the project, and the roll-to-roll nanoimprint process used in it at the following event:

Radtech Europe Conference in Warsaw, Poland, October 27–29, 2025

### About the project Design-PV

Funded by: Federal Ministry for Economic Affairs and Energy  
Funding reference: 03EN1084A  
Funding framework: 7th Energy Research Program  
Duration: 01.11.2023 – 31.10.2026

### Project partners

- SURTECO GmbH
- FLACHGLAS Sachsen GmbH
- Ronge GmbH
- TOMASIC Engineering GmbH
- Fraunhofer Institute for Electron Beam and Plasma Technology FEP
- Institut für Solarenergieforschung GmbH Hameln (Institute for Solar Energy Research in Hameln)

### More about nanoimprint lithography (NIL)

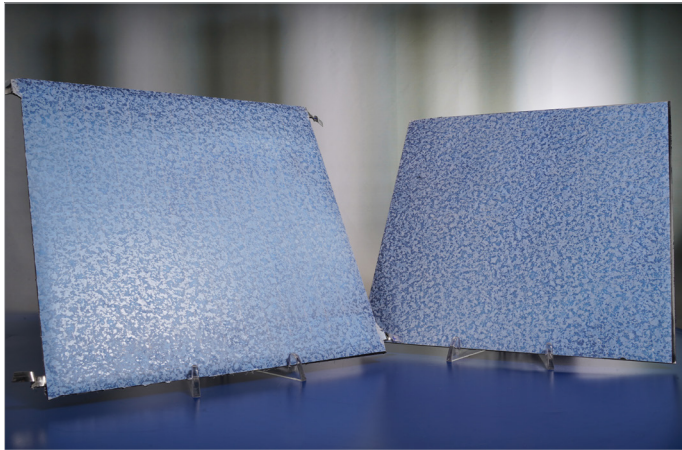
NIL is used to fabricate surface topographies on polymer films with feature sizes ranging from a few 100 nanometers across a few micrometers to the millimeter range in a roll-to-roll process. This enables large-scale, continuous production of films. A structured master roller is pressed into a liquid coating, while the coating is simultaneously cured. Cross-linking the lacquer using electron beams allows for fast and efficient curing of the structures and offers the flexibility to integrate various pigments or particles into the lacquer. The process is carried out on a web width of up to 1250 mm and a process speed of several tens of meters per minute, thus guaranteeing high productivity.

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**Freely combinable facade elements with decorative film – on the left, a PV module and, on the right, a sheet metal facade element without PV functionality.**

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