morphotonics

Roll-to-Plate Nanoimprinting for Solar Energy Applications

EPIC Online Technology Meeting
Photonics for Solar Energy Systems

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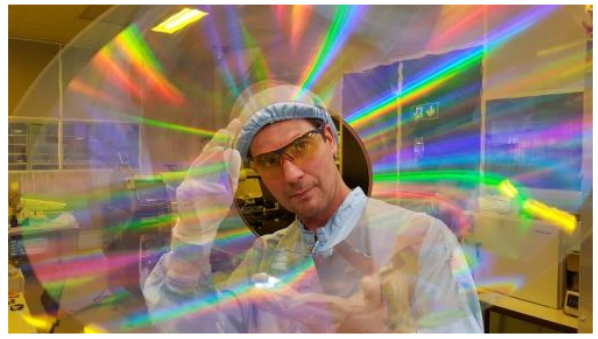
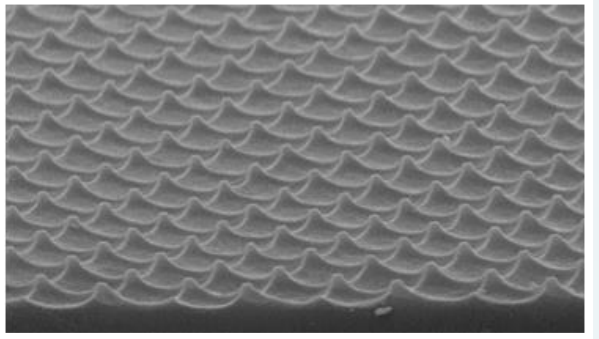
EPIC
European Photonics Industry Consortium

Phabulous

Morphotonics | About Us

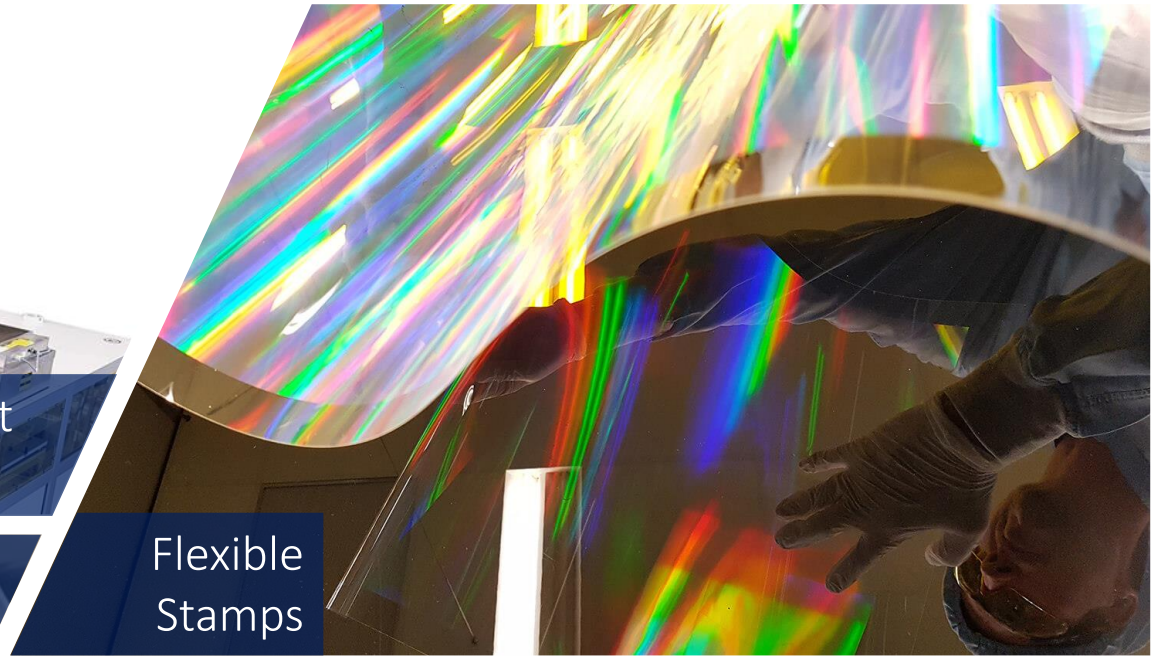
- **Business –** OEM supplier of equipment & consumables for micro- and nano imprinting of large-area substrates and devices.
- **Background**
  - Founded in 2014. 25 Employees. HQ in Veldhoven, Netherlands – world-class Photonics R&D region.
  - Primary focus in Displays, Lighting, and Solar with many emerging applications
  - Independent IP: Multiple patents granted & pending
- **Proven Technology**
  - 10+ years experience in mastering & replication technology
    5+ years dedicated R&D on large area nanoimprinting technology
  - 24/7 operational, fully integrated Roll-to-Plate (R2P) nanoimprinting line at display customer in Asia. Strong & diversified order pipeline.





Morphotonics | Products

Equipment



Flexible Stamps

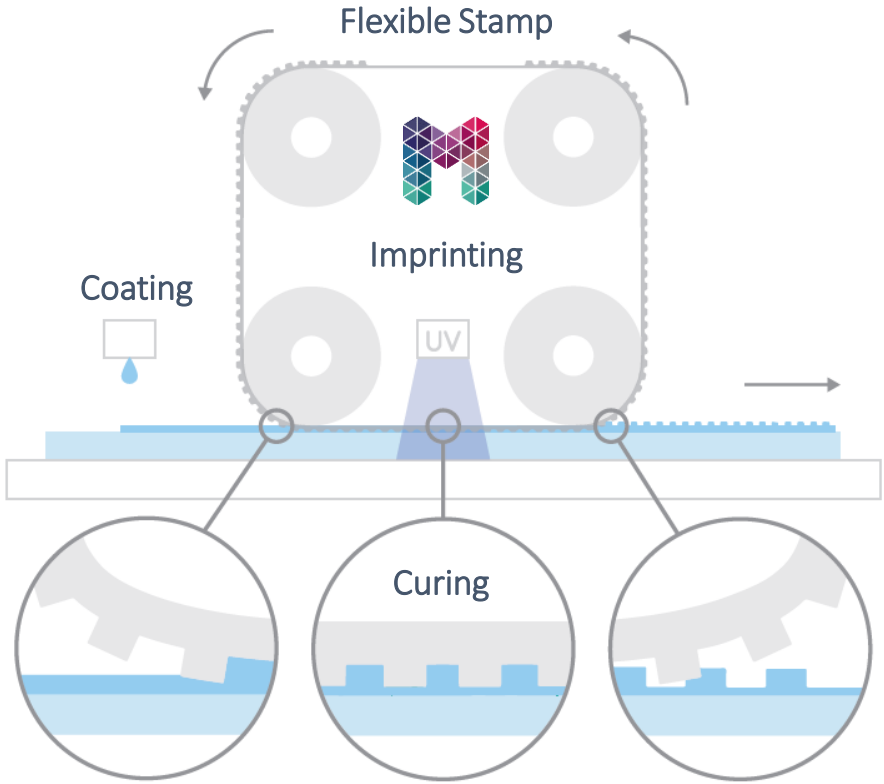
Competence Center

UV Imprint Materials

Roll-to-Plate Nanoimprinting

Morphotonics' focus is on *Extremely-Large-Area Nanoimprinting* (i.e. 1.2 m x1.6 m)

- Imprint textures on discrete substrates
- Transparent or opaque substrates
- Re-usable flexible stamp
- Structures from 500 µm down to 50 nm
- Imprint speed up to 10 m/min
- Use of robust UV curable materials suitable for high-temperature downstream processes or outdoor conditions



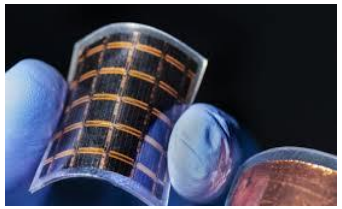
Roll-to-Plate Nanoimprinting for Solar Applications

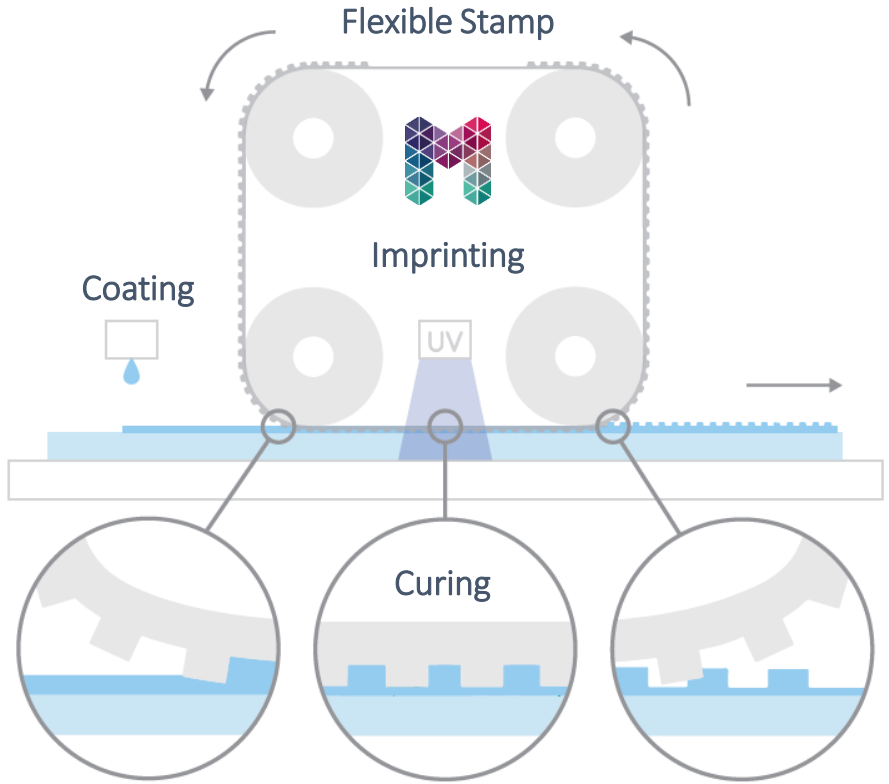
Large area nanoimprinting enables nano- and micro-patterning on solar module scale

Bifacial Solar Panels
Can produce 30% more energy than traditional solar panel

Smart Windows
Integrated PV cells in windows

Indoor PV for IoT
Powering the IoT revolution





UAVs
Recharging while in motion with minimal aerodynamic

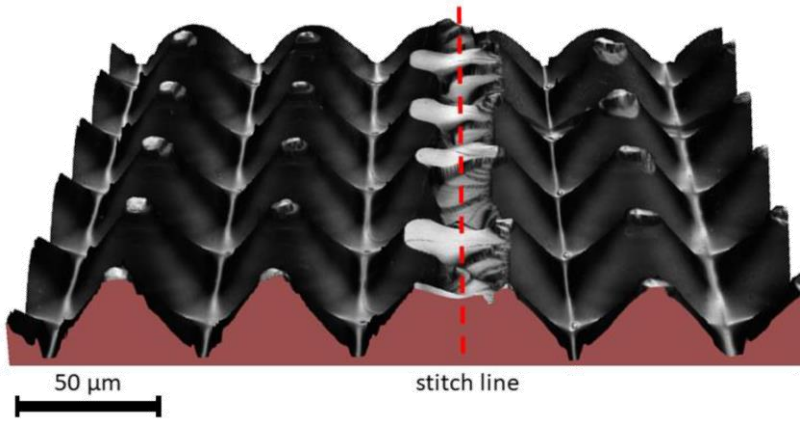
Aerospace
High durability & efficiency required

Automotive
Charging EV car batteries using solar

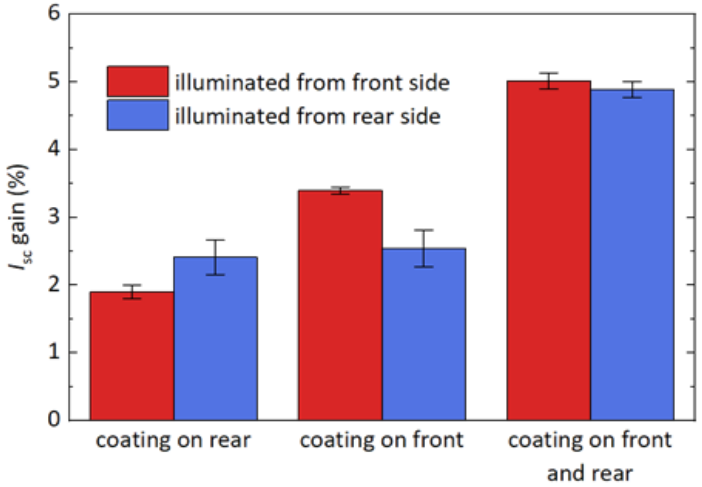
Light Trapping Solutions for Bifacial Solar Panels

- A turnkey solution to increase the solar panel efficiency
  - Both sides can collect energy, ability to capture the light that bounces off the ground
  - In some cases, can produce 30% more energy than a traditional solar panel

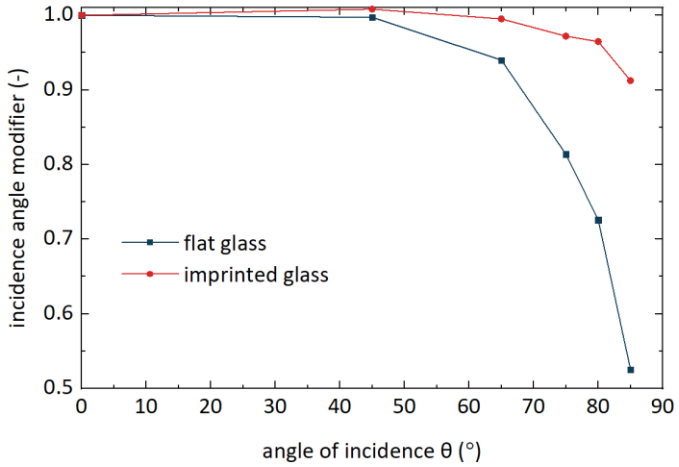
- Roll-to-Plate technology advantage:
  - Morphotonics' NIL structures can further increase light collection on both sides of the PV modules by reducing reflection and trapping light inside the modules
  - 2 to 5% gain determined in R&D panel tests at standard conditions
  - Bifacial solar panels have more benefit from the NIL structure compared to mono-facial panels due to the typically larger contribution of diffused light at the rear side of the modules



3D confocal laser microscope image of two stitched textured imprint areas



I_{sc} gain of bifacial mini-modules at normal incidence after imprinting



incidence angle modifier of imprinted bifacial mini-modules

ECN › TNO innovation for life

POLARIS

TKI URBAN ENERGY
Topsector Energy

Let’s Team up for Solar!

Morphotonics is looking for launching partners to:

- Team up in the development of micro- and nano-textures for solar energy applications
- Bring Roll-to-Plate micro- and nano- texturing to the solar market

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