

Replication of micro- and nanostructured surfaces by imprint lithography

Fabrication of plastic surfaces with nanometric resolution

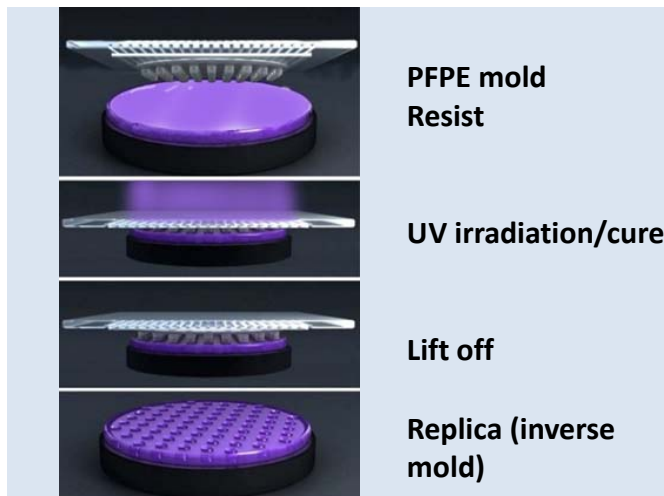
Collaboration Offered

Replica of features down to 10 nm with very high aspect ratio by soft UV-assisted nanoimprint lithography using polymers with with very low viscosity

Description

We developed a novel elastomeric material – i.e. a UV-curable tetrafunctional urethane methacrylate perfluoropolyether (PFPE)- with **very low viscosity** that allows replicating bidimensional and, with some limits, also 3D structures with high aspect ratio.

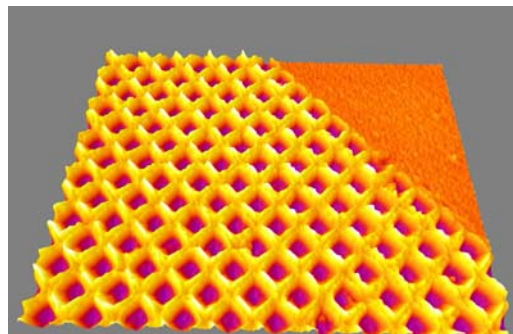
The procedure for the fabrication is shown below: it is very fast and **do not require any thermal treatment or the application of high pressures.**



Scheme: Simplified procedure of UV-imprint lithography

As an example, different **micro and nano-optical components**, such as diffraction gratings, microlens arrays, phase plates, waveguides and photonic crystals, could be easily fabricated.

We have demonstrated that a micro- or nanostructured artificial or natural surface may be replicated. We prepared different substrates that, after gold or aluminium coating (by PVD) have shown **Surface-Enhanced Raman Scattering (SERS)**.



Example of Al-coated plastic substrate with SERS activity

Collaboration Objectives

- **Industrial scale-up of the methodology.** Development of a production strategy (e.g. by roll-to-roll method), sub 10-nm scale.
- **Production of nanooptical devices.** Replica of diverse devices with features in the sub 10-nanometer scale and high aspect ratio.
- **New disposable SERS active substrates.** This new kind of cheap SERS substrates made of polymer and aluminium (with a regular pattern) have improved the results and reproducibility of SERS results and simplify the measurement process, making the technique easy to use in any laboratory.

Area of Expertise for Partners Sought

Materials science. Optics, Raman spectroscopy.

Main references

[Materials Today, 2014, 17, 358–359](#)

[Microelectronic Engineering 97 \(2012\) 208–211.](#)

Oral presentations: *Imagine Nano2013* (Bilbao-Spain); *Nanolitho 2012* (San Sebastian- Spain); *Optics 2014* (Kolkata-India).

Research Group and Contact

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