

## Direct imprinting of polymerizable ionic liquids by UV and

### T-NIL

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Nanoimprint lithography (NIL) represents one of the most important patterning techniques widely used in production photonic devices. Its several advantages including low cost, high throughput and high resolution obtained, makes it a promising technique of structuration that can be applied for novel materials. Ionic liquids (ILs) show several advantages for possible application, including: low vapor pressure, high chemical and thermal stability and low toxicity. Moreover easy modification of anion and cation groups allows the control of final properties of ILs.

The present work focuses on the use of ionic liquids for structuration using NIL, either cured thermally (T-NIL) or by UV light (UV-IL) and their potential to replace traditional lithography resists. We test different ammonium based ILs with different anion groups and different number of polymerizable vinylbenzene groups. It has been shown so far that ILs can be solidified using electron beam but very few studies has been done by means of nanoimprint lithography [1,2].

Different optical components, have been obtained using T-NIL and UV-NIL (Figure 1) with rigid and flexible molds. The obtained structures are well reproduced, yielding a lateral resolution < 1 $\mu$ m. Moreover, their solvent resistance indicates the occurrence of polymerization process of ILs. The type of process and imprinting conditions will be discussed depending on the type of ionic liquid.

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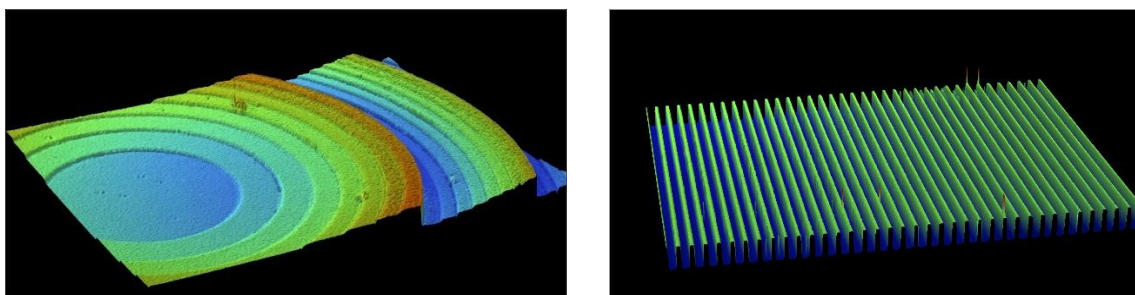


Figure 1 Optical profilometry images of Fresnel lens and optical grating obtained by UV-NIL with IL using a PDMS mold

#### References:

- [1] K. Rola et al. *Proc. SPIE 10915, Organic Photonic Materials and Devices XXI* **2014**, 109151E
- [2] A. Gopakumar et al. *J. Phys. Chem. C* **2014**, 118, 16743