Printed polymeric microlenses for solar microconcentrators

[1] F. Loffredo, G. Nenna, F. Villani, C. Minarini and F. Roca

[2] S. Kämmer, D. Sancho-Martinez, M. Schmid

[1] *SSPT-PROMAS-NANO Department - ENEA Portici Research Centre, 80055 Portici, Italy*

[2] *Helmholtz-Zentrum Berlin für Materialien und Energie, Hahn-Meitner-Platz 1 D-14109 Berlin*

Microconcentrators could further boost efficiency of solar cells giving rise to a possible new route in the solar concentrators. By means of properly designed optics structures and in particular of polymeric microlenses it is possible to decrease the size of the cells and with it the number of manufacturing defects going to improve so far the efficiency of the resulting structure.
The present work is focused on the manufacturing of inkjet printed optical microstructures. Poly(methyl methacrylate) (PMMA). The ink, prepared by dissolving PMMA in pure N-methyl-2-pyrrolidone (NMP), was printed on glass substrates covered by highly hydrophobic films. The optical properties of the PMMA-microstructures were investigated by a Mach-Zehnder interferometer. In figure 4 the optical experimental setup is schematically reported. In order to evaluate the optical properties a Mach-Zender system in confocal and cut-eye configurations has been used.
The interferometric fringe images and wavefront error analysis in terms of Zernike polynomial will be reported, see the example of figure 1. The results confirms that the described method could represent a new route for low cost production of microconcentrators.
The shape of microlens are demonstrated to have a spherical morphology by means the right deposition process parameters. Further research is in progress to have a better control on the deposition parameter and realize a more systematic study to ensure the best optical quality for the realized polymer microlenses and the final structure of the solar microconcentrator.

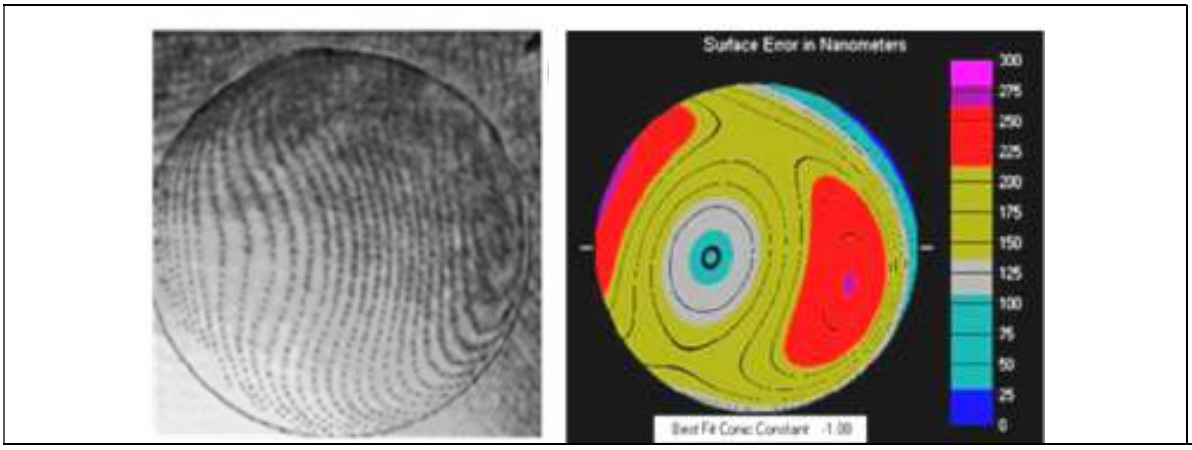

Figure 1: interferometric fringe image and wavefront error analysis

References

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