Hybrid-Polymer Photonic Microring Resonators for Biosensing Applications by Nanoimprint Lithography

R. Morarescu*, P. Pal*, X. Han**, M. Zhao**, P. Bienstman*, G. Morthier*

*Photonics Research Group, NB - Photonics, Ghent University - IMEC, Belgium
**School of Physics and Optoelectronic Engineering, Dalian University of Technology, China

Nowadays there is a permanently increasing demand and need for simple, low cost, user friendly and real-time monitoring devices in biosensors. In this context our contribution aims to investigate biosensors based on the shift of the resonance wavelength of polymer microring resonators due to the attachment of selected biomolecules to their surfaces. They are targeted for operation at visible wavelengths, where cheap light sources are available and water absorption is much lower than at infrared wavelengths. Polymers are promising materials for microresonators because of their good properties, with most importantly high optical transmittance, but also versatile processability and their potential for low-cost production. We will report on the high quality devices that were fabricated with a minimal set of process steps, by direct patterning of hybrid-polymer microring resonators using UV- nanoimprint lithography. They are transparent at visible wavelengths, and we expect higher quality factors of the ring resonators and thus an improved detection limit of the biosensors.

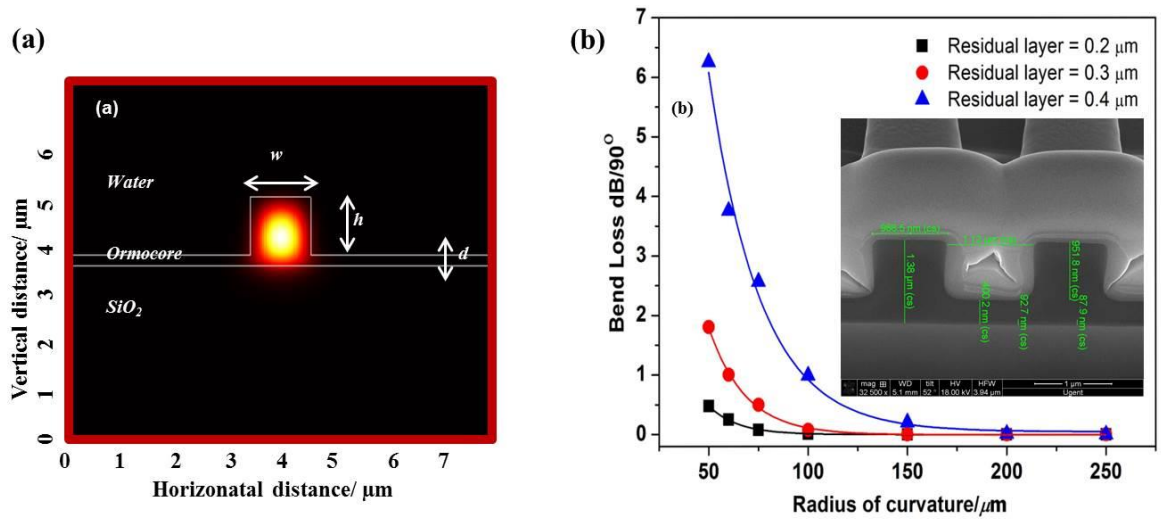

Fig. 1 (a) The Fimmwave simulated intensity distribution of the fundamental TE -mode of the rib waveguide used in our design. (b) The bend losses of polymer rib waveguide with different residual layer dimensions. The inset shows a SEM cross-section in the gap region of the imprinted hybrid-polymer microring resonator.

References

[1] M. Hiltunen, J. Hiltunen, P. Stenberg, J. Petäjä, E. Heinonen, P. Vahimaa, and P. Karioja,''Polymeric slot waveguide at visible wavelength,'' *Opt. Letters*, vol.37, no. 21, pp. 4449-4451, Nov. 2012.

[2] M. H. M. Salleh, A. Glidle, M. Sorel, J. Reboud and J. M. Cooper, ''Polymer dual ring resonators for label-free optical biosensing using microfluidics,''*Chem. Commun.*, vol. 49, pp. 3095-3097, Jan. 2013.