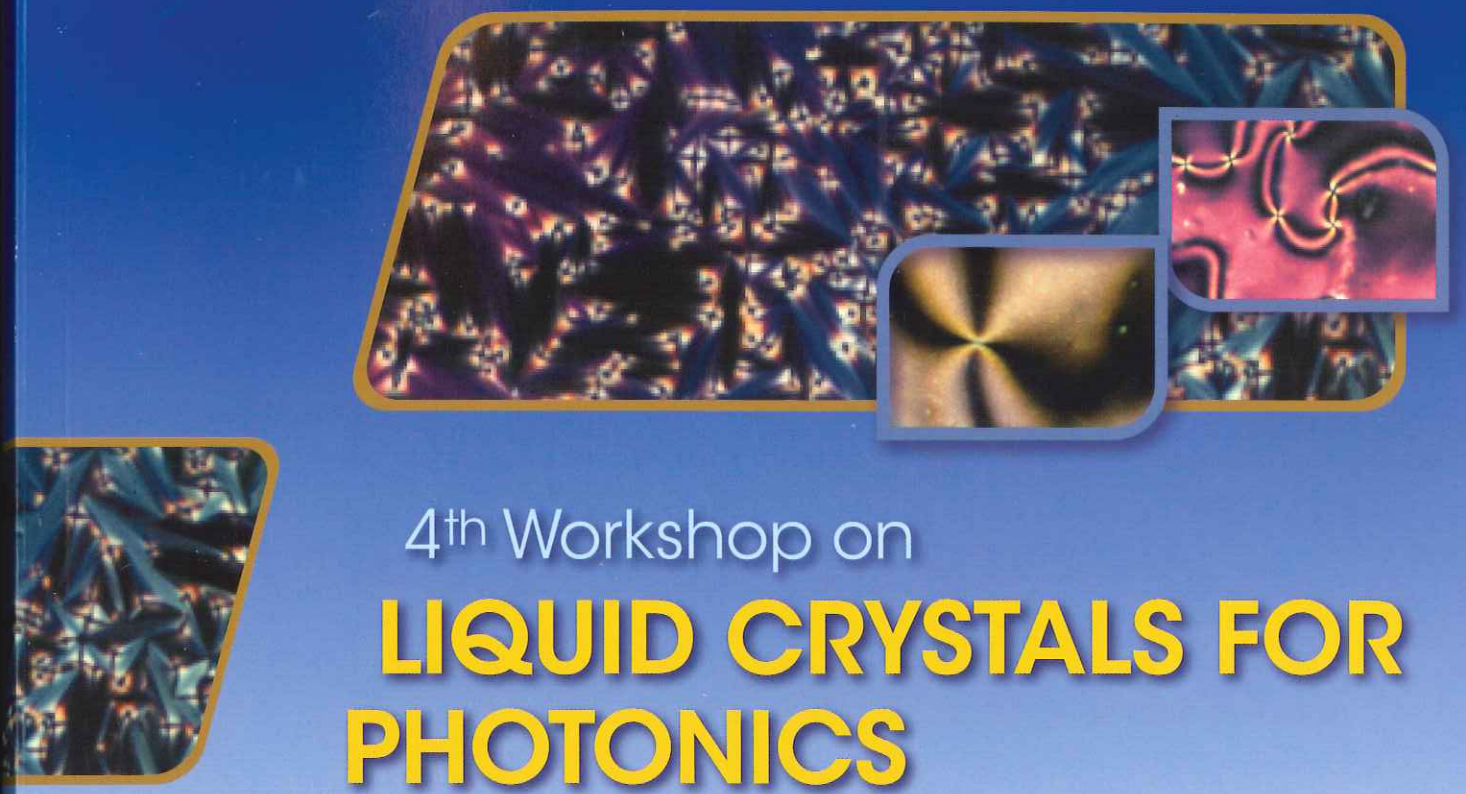

4th Workshop on
LIQUID CRYSTALS FOR PHOTONICS

December 9-11, 2012

Mr and Mrs Lee Siu Lun Lecture Theater (LT-K), HKUST

Sponsors

THORLABS

LCD&LCM
SHENZHEN JINGHUA DISPLAYS CO.,LTD

香港科技大學
THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

電子及計算機工程學系
DEPARTMENT OF ELECTRONIC & COMPUTER ENGINEERING

SENG
SCHOOL OF ENGINEERING

Tuning and trimming of SOI ring resonators with liquid crystals

K. Neyts[1,3], W. De Cort[1,2,3], T. Ako[1,3], R. Baets[2,3], J. Beeckman[1,3]

[1]*Liquid Crystals and Photonics group, ELIS Department, Ghent University, Belgium*
[2]*Photonics Research Group, INTEC Department, Ghent University – IMEC, Belgium*
[3]*Center for Nano and Bio-Photonics, Ghent University, Belgium*
Email: kneyts@elis.ugent.be

A ring resonator is a photonic device that can filter out narrow wavelength bands for which the ring is in resonance. The principle is illustrated in Fig. 1. The ring resonator can be very small with low losses in the IR when it is made in the silicon-on-insulator technology. When the ring resonator is covered with a layer of liquid crystal, the orientation of the liquid crystal and the resonance wavelengths can be modified by applying a potential difference between the Si substrate and the ITO electrode [1,2].

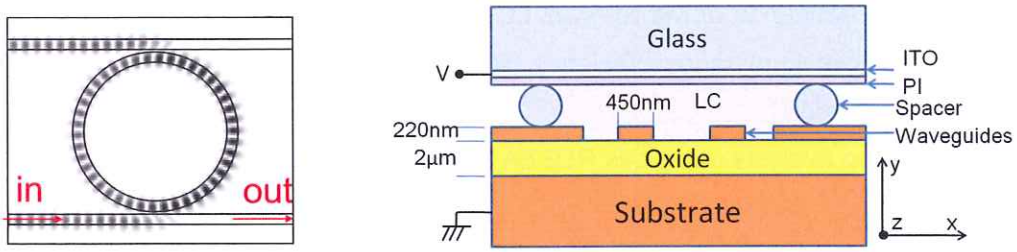

Figure 1. Ring resonator with LC overlay. Left: for wavelengths where the ring is in resonance, the output is low. Right: cross section with Si substrate, Oxide interlayer, Si waveguide and LC overlay.

The tuning range depends on the configuration (orientation of LC alignment, light polarization and direction of the applied field), with the highest value for TM waveguides and switching from parallel to vertical (Fig. 2). We also performed trimming experiments in which the wavelength tuning is made permanent by polymerization of an LC/monomer mixture [3].

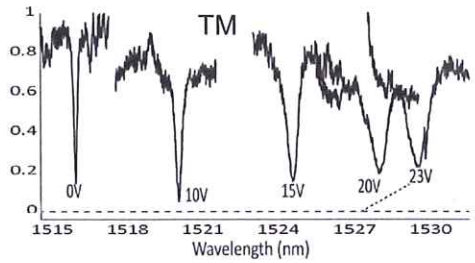

Figure 2. Tuning of a TM ring resonance by voltage.

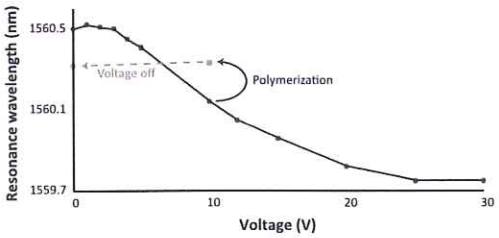

Figure 3. Trimming of a ring resonator by polymerization.

References

[1] W. De Cort, J. Beeckman, R. James, F. Fernandez, R. Baets, K. Neyts, Opt. Lett. **34**, 2054 (2009)

[2] W. De Cort, J. Beeckman, T. Claes, K. Neyts, and R. Baets, Opt. Lett. **36**, 3876 (2011)

[3] S. Lambert, W. De Cort, J. Beeckman, K. Neyts, and R. Baets , Opt. Lett. **37**, 1475 (2012)

Acknowledgment: This work is supported by the IWT (Flemish Institute for Science and Technology) and the IAP project Photonics@be (Belgian Science Policy).