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Liquid crystal technology for wavelength tuning in SOI structures

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In this work, we want to study the tuning of wavelengths in SOI filter structures (e.g. ring resonators) with a top layer of liquid crystal. Liquid crystal molecules are typically rod-shaped, which gives the material its anisotropic nature. If there is an electric field present, the molecules will align themselves along the fieldlines and the optical properties of the material will change.

We want to exploit this electrooptic effect to change the effective refractive index of the mode propagating in the SOI structures below the liquid crystal. We will apply an electric field to achieve this. As the evanescent tail of the light extends in the liquid crystal, it will still feel the changes in the top layer and there will be an effect on the effective index. Many integrated optical filters work in such a way that the effective refractive index in part determines the filtered wavelengths. It would therefore be possible to control the filtered wavelengths through the electric field.

We will discuss the fabrication of liquid crystal cells on an SOI chip and through simulations and experiments, we will examine the tuning possibilities of filter structures on the chip.

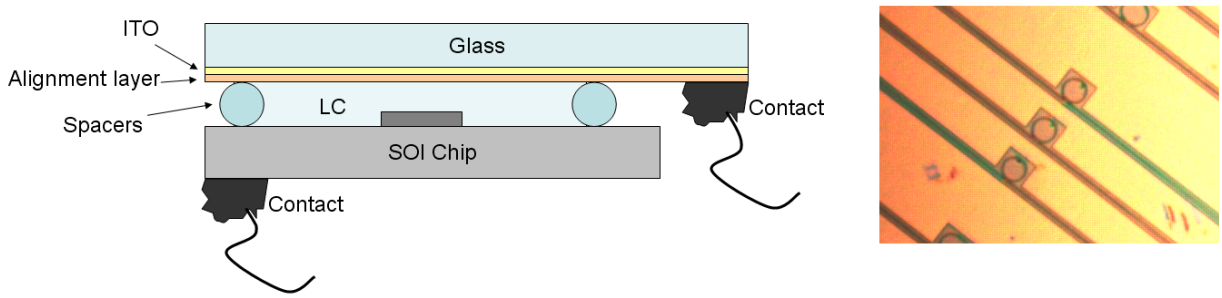

Figure: Left: Crossection of an SOI chip with liquid crystal top layer. Right: Example of a liquid crystal cell on an SOI chip.