

Liquid crystals and photonic integration: materials, properties, technologies, devices

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Liquid crystals (LC) are materials with good electro-optic and nonlinear optical properties suitable to make switchable and reconfigurable devices using low driving power.

These materials have been mainly developed for flat panel displays but their mature technology can be effectively used to make integrated optic devices for other applications such telecom, sensors, datacom and so on.

In the first part of this lecture molecular orientation of LC mesophases and the corresponding dielectric, elastic, thermal and optical properties will be presented. In particular the relationship between molecular orientation and optical anisotropy of LC will be shown. Linear and nonlinear propagation of light will be discussed. The basic fabrication technologies of LC electrooptic devices and the most used design techniques will be illustrated.

In the second part the state of art of the most recent techniques will be presented in which liquid crystals are combined with other materials to make active integrated optic devices such as tuneable lasers, photonic switches, optical tunable filters based on Bragg gratings and so on.