

Electro-optically tunable devices and second harmonic generation in patterned lithium niobate

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Thanks to the large electro-optic (EO) effect and second order nonlinearity of lithium niobate (LN), different kinds of EO tunable functionalities and nonlinear conversion are investigated in our group. These devices are modulator, beam deflector, temperature sensor, tunable add-drop filter and highly efficient second harmonic generation (SHG) etc.

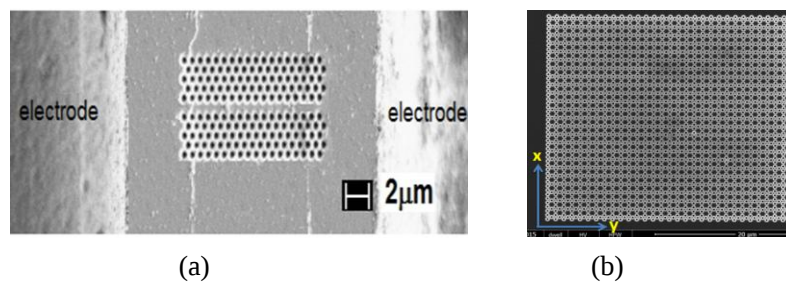


Fig. 1 (a) LN modulators. (b) Fano resonance in Suzuki Phase lattice LN PhC functioned as temperature sensor.

A PhC based Fabry-Perot cavity in LN as shown in Fig.1 (a) is demonstrated as modulators with tunability of **0.6 nm/V** whereas the interaction length is of **only 6 μm**. In addition, a lateral shift of mode center tunability of **~0.240 μm/V** beam deflectors designed with isosceles triangular electrodes on a width of 80 μm LN APE waveguide is achieved. EO based sensing functionalities is also demonstrated where the temperature sensitivity is **1 nm/°C** as shown in Fig. 1(b). Other devices such as tunable add-drop filters and highly efficient SHG in patterned LN are successfully demonstrated.

Appropriate patterned LN especially resonance based structure can enhance light-matter interaction and boost EO and second order nonlinearity in LN. In addition, optimizing the EO effect (maximizing the overlap integral of electric field with optical mode distributions) in LN would open up a new generation of high performance LN based devices (modulators, filters, sensors, beam deflectors and SHG etc).