Lithium niobate metasurfaces

With the support by the National Natural Science Foundation of China, the research team led by Prof. Xu JingJun (许京军) and Assoc. Prof. Ren MengXin (任梦昕) at the Key Laboratory of Weak-Light Nonlinear Photonics, Ministry of Education & School of Physics of Nankai University recently reported the first realization of lithium niobate metasurfaces, which was published in *Laser & Photonics Reviews* (https://doi.org/10.1002/lpor.201800312).

Lithium niobate (LN) is an important photonic material, which is famous for its outstanding electro-optical effect. The LN electro-optical modulator is essential to convert electronic data to optical information, which is the core component in present global fiber communication systems. But the commonly used LN based photonic devices are still bulky. To meet the development tendency of integrated photonic devices with high-speed and less energy consumption, the realization of compact LN photonic devices is urgently required. However, LN is chemically inert and too hard to cut, and LN nanostructure cannot be made either by conventional chemical etching or by mechanical sculpture. Such problems impede the development of the integrated LN photonic device.

Recently, the group from Nankai University successfully addressed the problem and fabricated the LN nanograting metasurfaces using the state-of-the-art FIB technique. High-quality optical resonances and vivid colors were realized. This enables people using LN to manipulate light behaviors at the nanoscale at will. Meanwhile, the results indicate a bright future for the applications of LN in the field of nanophotonics and integrated photonics.

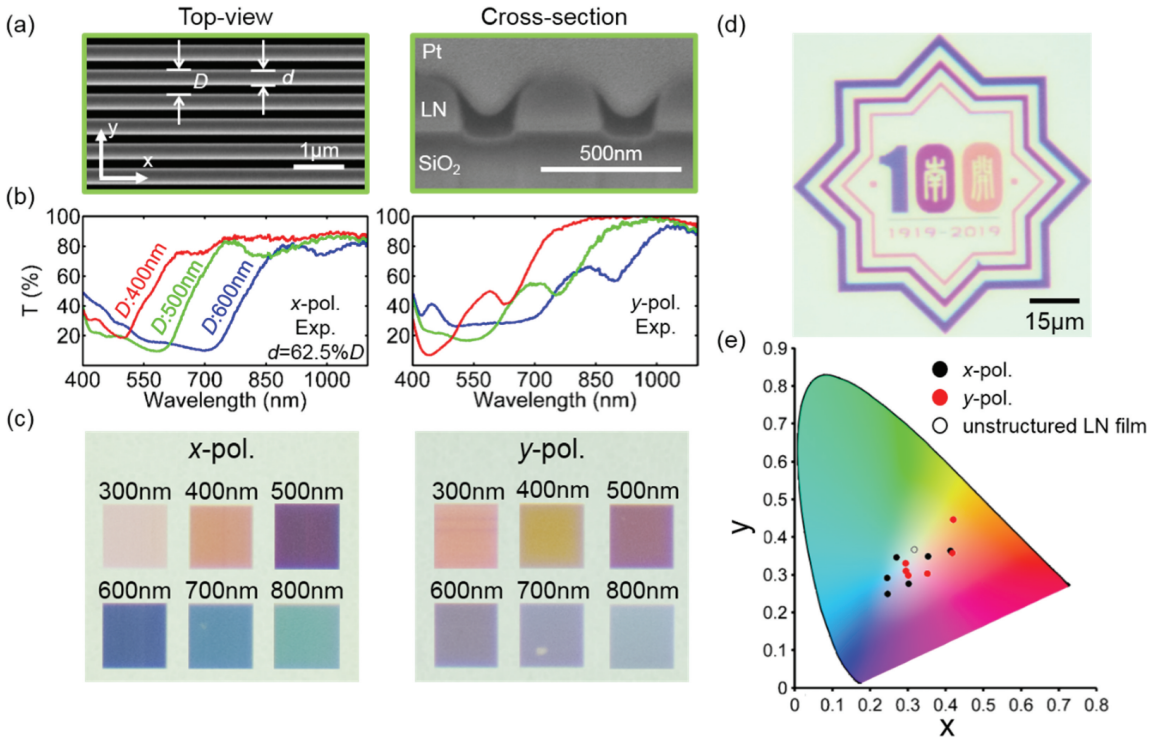

Figure (a) The typical SEM images of fabricated array (D: period and d: width of grating ridge). (b) The experimental transmission spectra for arrays with D of 400, 500, and 600 nm for orthogonal polarizations. (c) Photographs of LN metasurfaces, illustrating the vibrant colors and the continuous color change while increasing lattice periods from 300 to 800 nm. (d) Photograph of a single colorful badge of "Nankai University 100th anniversary" fabricated using the metasurfaces. (e) The chromaticity coordinates corresponding to the experimental color.