# Photonics with Thin Film Lithium Niobate

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Thin film lithium niobate (TFLN) has the potential to revolutionize photonic integrated circuit (PIC) technology, due to its ability to combine low optical loss, tight optical confinement, and active optical functions. In particular, the readily available electro-optic effect and 2nd order nonlinear effect afford more unique functionalities to TFLN compared to other, more mature, PIC materials, including silicon (Si), silicon nitride ($SiN_x$), silicon dioxide ($SiO_2$) and indium phosphide (InP), while the refractive index contrast between TFLN waveguide and typical cladding materials such as $SiO_2$ is sufficiently large to support relatively tight bending, leading to small component sizes.

Over the past few years, research on TFLN-based PICs has blossomed. TFLN electro-optic modulators in particular have benefitted hugely from the natural advantage of its electro-optic effect and are now being commercialized, with several start-up companies worldwide already publicizing small-size, low-drive voltage prototypes. The research attention is now moving on to other, more challenging aspects of TFLN technology. These include on-chip laser sources and devices based on its nonlinear optical effects. In addition to the classical optical information applications including communications and sensing, TFLN PICs exploiting high quality on-chip laser sources and nonlinear devices are also promising candidates for integrated quantum photonics.

To spotlight advances in TFLN technology, we present a special collection published across *Advanced Photonics* and its sister journal *Advanced Photonics Nexus*. This collection includes two review articles and two original research articles. We feature a wide-ranging review article which we hope may help those new to the field to attain a comprehensive overview of photonics based on TFLN (https://doi.org/10.1117/1.AP.4.3.034003). We also feature a review article focused on the nonlinear photonics in TFLN to enable an in-depth inspection of this research area (https://doi.org/10.1117/1.AP.4.3.034001). The two research articles, one combining the generation of very narrow linewidth laser emission with tunability provided by the electro-optic effect (https://doi.org/10.1117/1.AP.4.3.036001) and the other on the generation of optical frequency combs exploiting nonlinear effects (https://doi.org/10.1117/1.APN.1.1.016001), represent distinctive progress in light sources based on TFLN.

We hope our readers enjoy these articles and find them useful. For greater insight and enrichment, we also offer an interview with TFLN innovator and pioneer Marko Lončar (https://doi.org/10.1117/1.AP.4.3.030503) and a perspective by Zhenda Xie and Shining Zhu (https://doi.org/10.1117/1.AP.4.3.030502).