

TRR Guest Scientist Lecture / Seminar

Date/Time: 09.10.2019 / 14 Uhr
Location: P8.4.09

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Thin film lithium niobate for integrated (nonlinear) optics: Fabrication of highly uniform periodic domain structures

Abstract:

In recent years thin film lithium niobate is playing an increasing role for integrated optical applications due to the large advantages in efficiency and footprint, which this platform provides over traditional integrated optics in bulk lithium niobate. In particular, the dramatic decrease in waveguide cross-section offers significant increases in conversion efficiency in nonlinear-optical processes and quantum optics. Efficient nonlinear-conversion require phase matching between the interacting beams, which can be achieved in – thin film or bulk - lithium niobate by making use of quasi-phase matching in periodically poled ferroelectric domain structures. A good process control and understanding of the poling parameters is key to achieve highly uniform poled domain structures suitable for optical applications. In this regard, the engineering of domain structures in thin film lithium niobate provides additional challenges compared to the poling process in bulk due to the thickness and geometry of films and the poling electrodes.

In this presentation I will talk about the application of thin films for nonlinear optics, which was made possible by our recent progress in periodic poling of thin film lithium niobate. In particular, I will focus on the monitoring and analysis of the domain engineering process by in-situ monitoring of the electro-optic phase shift in an optical mode coupled into a waveguide during poling and the application of second-harmonic microscopy, which can provide valuable information on the quality and depth of poling. Furthermore, I will talk about the general integration strategy of thin film lithium niobate into the widely used silicon photonics eco-system.

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