香港科技大學
THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

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Joint Seminar

Lithium Niobate: From Materials Preparation to The Design of Periodic Polarization Device

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Prof. Yuanhua Sang is a professor at the State Key Laboratory of Crystal Materials, Shandong University, China. His research interests are functional crystal materials for nonlinear optics and nanomaterials for solar light conversion. As the project leader, he has managed 9 projects, such as the National Key Research and Development Project, National Natural Science Fund for Outstanding Youth Project, as well as Natural Science Fund for Outstanding Researcher of Shandong Province, etc. As the first author or corresponding author, he has published over 60 papers in Adv. Mater, Adv. Energy. Mater, and other important international academic journals, as well as more than 100 other cooperative articles. The personal H-index is 42 with over 7000 citations. More than 20 patents were authorized. He was awarded the first prize of Natural Science in Shandong Province as the second contributor (2019).

Abstract

The lithium niobate ($LiNbO_3$, LN) single crystal is an ideal material with the combination of good piezoelectric, electro-optical, and nonlinear optical properties. Especially in nonlinear, it is honored as optical silicon. As is well-known, the congruent LN crystal (CLN) shows a large number of intrinsic defects, which limits its optical applications significantly. Two approaches to eliminate these intrinsic defects and to improve the optical properties of LN single crystals are the growth of Mg-doped CLN crystals and near-stoichiometric LN single crystals (NSLN).

In this presentation, we would give a comprehensive introduction from preparation of LN polycrystalline materials to the fabrication of devices based on periodically poled lithium niobate (PPLN). The doped LN or a large size SLN single crystal was successfully grown by the Czochralski method, using the proposed homogeneous ion doping techniques, the wet-chemical method and the partial wet-chemical method. The corresponding optical superlattice materials were prepared by the autonomous technique, also, the fabrication of PPLN-based series of nonlinear optical devices, such as high efficiency green laser, tunable mid-infrared laser, reverse proton exchange waveguide and single-photon detector.

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