

Identification of Ferroelectric Domain Structures in BaTiO₃ for Raman Spectroscopy

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Abstract

Conventional Raman spectroscopy on BaTiO₃ determines vibrational modes by integrating over a macroscopic sample volume. In domain-rich materials and to account for microscopic surface domains, an experimental study of the domain distribution is desirable. We applied polarized light microscopy (PLM) and piezo-response force microscopy (PFM) to 40 μm thick BaTiO₃ single crystals in order to get an exact model of the domain distribution, which allows to allocate the laser spot of a micro-Raman spectrograph within a specific domain type. We are able to assign most of the Raman-active normal modes in polarized measurements, which are free of ferroelastic domain walls but not necessarily free of ferroelectric walls. We propose to study the influence of ferroelectric walls on the asymmetric peak shapes by an in situ combination of PFM and micro-Raman spectroscopy.