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Title:Lattice dynamics and broad-band dielectric properties of the KTaO_3 ceramics

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Abstract:High-density KTaO_3 ceramics were synthesized and studied by means of microwave, terahertz, infrared, and Raman spectroscopies. The results were analyzed together with recently published radio-frequency data. [S. Glinsˇek et al., J. Am. Ceram. Soc. 94, 1368 (2011)] Three polar modes expected for the cubic structure were observed. As in single crystals, the lowest-frequency TO1 mode (soft mode) strongly softens on cooling, while the TO2 and TO4 mode frequencies do not change with temperature. The permittivity does not show any significant dispersion below the soft mode frequency and its value in the kHz and GHz range is mainly given by the intrinsic polar lattice modes contribution. The soft mode frequency agrees with the values found in single crystals; this indicates a negligible influence of the grain boundaries on the dielectric response in KTaO_3 unlike in other ferroelectric or incipient ferroelectric perovskite ceramics.

Number of references:40

Inspec controlled terms:cooling - crystal structure - ferroelectric ceramics - ferroelectric transitions - grain boundaries - infrared spectra - microwave spectra - permittivity - phonon dispersion relations - potassium compounds - Raman spectra - soft modes - terahertz wave spectra

Uncontrolled terms:lattice dynamics - broad-band dielectric properties - high-density ceramics - microwave spectroscopy - terahertz spectroscopy - infrared spectroscopy - Raman spectroscopy - cubic crystal structure - lowest-frequency TO1 soft mode - cooling - lowest-frequency TO2 soft mode - lowest-frequency TO4 soft mode - permittivity - phonon dispersion - polar lattice mode - grain boundaries - ferroelectric ceramics - ferroelectric transitions - KTaO_3

Inspec classification codes:A6320D Phonon states and bands, normal modes, and phonon dispersion - A7780B Ferroelectric transitions and Curie point - A6170N Grain and twin

boundaries - A7720 Dielectric permittivity - A6160 Crystal structure of specific inorganic compounds - A7830G Infrared and Raman spectra in inorganic crystals - A7870G Microwave and radiofrequency interactions with condensed matter

Chemical indexing:KTaO₃/ss TaO₃/ss O₃/ss Ta/ss K/ss O/ss

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Discipline:Physics (A)

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