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**Raman and 23Na Solid-State NMR Studies on the Lead-Free Ferroelectrics Bi0.5 (Na1-Xkx) 0.5tio3 in the Morphotropic Phase Boundary Region**

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**Abstract**

The local structural changes, due to the substitution of the smaller Na+ by the larger K+ ion, in the [lead-free piezoelectric ceramic](https://www.sciencedirect.com/topics/materials-science/lead-free-piezoelectric-ceramics) compositions Bi0.5(Na1-*x*K*x*)0.5TiO3 have been studied using Raman and 23Na solid-state [NMR spectroscopy](https://www.sciencedirect.com/topics/materials-science/nuclear-magnetic-resonance-spectroscopy). Different close compositions in the solid solution series Bi0.5(Na1-xKx)0.5TiO3 (0 ≤ x ≤ 0.36, Δx = 0.02) are studied in the morphotropic phase boundary (MPB) region arising from the different crystal structures of the end members Bi0.5Na0.5TiO3 and Bi0.5K0.5TiO3. Close correlations between the Raman and NMR parameters with the performance parameters of the system have been observed, suggesting the role of the local structural changes in determining these parameters. Raman and 23Na NMR studies showed that the onset of the MPB region is at x = 0.16 and the MPB region corresponds to 0.16 ≤ x ≤ 0.24 where better performance parameters are observed.

**Keywords:**

Ceramics, Phase transitions, Nuclear magnetic resonance (NMR), Raman spectroscopy, Dielectrics

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