In-situ Measurement of Cation Ordering in Electroceramics

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Electroceramics are critical elements in microwave devices widely used in communications equipment and a full understanding of their crystal chemistry is fundamental to future development. High temperature processing is crucial to the performance of these oxide materials in applications, due to the resulting control over both atomic scale structure and domain size over which the ordered structures persist.

We have developed high resolution neutron and synchrotron powder diffraction methods to study the structural development of commercially-used ceramics such as $Ba_3ZnTa_2O_9$ (BZT) and $Ba_3CoNb_2O_9$ (BCN) under industrial processing conditions[1] at temperatures of up to 1500 ºC on timescales of minutes and in some cases seconds. The studies provide insight to domain growth during processing and quantitative information on order-disorder temperatures and thermodynamic processes affecting B-site cation ordering in the perovskite structures.

[1] Moussa S.M., Ibberson R.M., Bieringer, M., Fitch, A.N., Rosseinsky, M.J. *Chem. Mater.*, 2003, **15**, 2527.

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