

## **A New Family of Tetragonal Tungsten Bronze Ferroelectric Ceramics**

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The phases,  $\text{Ba}_2\text{RETi}_2(\text{Nb,Ta})_3\text{O}_{15}$ : RE = larger rare earth cation, have tetragonal tungsten bronze crystal structures. The phases exhibit considerable variations in stoichiometry through variable Ba:RE and Ti:(Nb,Ta) ratios linked to possible variation in oxygen content. Each phase has high and low temperature polymorphs with transition temperatures ranging from  $\sim 200$  K (RE=La) to  $\sim 700$  K (RE=Dy). The low temperature polymorphs are ferroelectric and exhibit a transition from relaxor to first order behaviour with decreasing rare earth ion size.

An overview of the crystallography, phase equilibria and electrical properties will be given together with consideration of possible applications.