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Effects of Sr-substitution on structure, dielectric, ferroelectric and magnetic properties of $(\text{Sr}_x\text{Ba}_{1-x})_4\text{Sm}_2\text{Fe}_2\text{Nb}_8\text{O}_{30}$ ceramics

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Abstract

$(\text{Sr}_x\text{Ba}_{1-x})_4\text{Sm}_2\text{Fe}_2\text{Nb}_8\text{O}_{30}$ ($x=0, 0.1, 0.2, 0.3, 0.4$) ceramics with tetragonal bronze structure were prepared by the standard solid-state method. With the increase of x , $(\text{Sr}_x\text{Ba}_{1-x})_4\text{Sm}_2\text{Fe}_2\text{Nb}_8\text{O}_{30}$ ceramics transform from ferroelectric to paraelectric. The composition $x=0$ shows first-order ferroelectric transition with T_c above room temperature. The other compositions exhibit broad dielectric peaks with frequency dispersion, indicating a relaxor ferroelectric transition. Saturated P - E hysteresis loops and obvious peaks in the charging current-field (J - E) curves are observed at room temperature for $x=0$ and 0.1 while paraelectric characteristics are detected for the others. Magnetic hysteresis loops are obtained for all the compositions and the remanent moment increases monotonously from 0.14 emu/g to 1.21 emu/g with the increasing concentration of Sr. All the results are expected to provide valuable guidance for searching new multiferroic tungsten bronze ceramics.

Keywords: A. Ceramics; B. Solid state reactions; C. Multiferroic properties; D. ferroelectric measurements, magnetic measurements.

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