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Effect of elastic strain and Sc dopant concentration-dependent cell volume on the electrical properties of Epitaxial (Ba,Sr)TiO₃ thin films
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TERIALS SCIENCE AND ENGINEERING TEAM, FUJITSU LABORATORIES
LTD. TEAM — We present the results of a systematic study of the correlation
between dopant concentration-dependent elastic strain and dielectric properties in
(Ba,Sr)TiO₃ films. For this work, undoped and Sc-doped (Ba,Sr)TiO₃ thin film
capacitors epitaxially grown on SrTiO₃ substrate were prepared by a sputtering de-
position method. Sc-doped BST capacitors exhibit significantly higher permittivity
and lower leakage current density, but little effect on the loss tangent, as compared
to nominally undoped BST capacitors. The Ti/(Ba+Sr) ratio of the films and
Sc dopant concentration-dependent unit cell volume, as determined by x-ray $\sin^2\psi$
analysis, are consistent with the preferential B-site occupancy of the Sc dopant. Fur-
thermore, this work suggests that dopant concentration-dependent elastic strain as
well as the 2D clamping effect of thin films on a thick substrate¹ must be considered
to fully understand the dielectric behavior of perovskite titanate thin films. 1. N.
A. Pertsev, A. G. Zembilgotov, and A. K. Tagantsev, Phys. Rev. Lett. 80, 1988
(1998)

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