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Influence of strain relaxation and atomic interface configuration on the dielectric response of BST thin film capacitors REGINA DITTMANN, RAFAEL PLONKA, PATRICK SCHÜTZENDORF, PERTSEV NIKOLAY, SHAOBO MI, CHUNLIN JIA, RAINER WASER, Research Centre Juelich — The collapse of the dielectric response which is commonly observed in $Ba_xSr_{1-x}TiO_3$ (BST) thin films is a topic of general physical interest as well as a key issue in terms of a possible application of this material in future DRAM storage capacitors. We addressed the influence of substrates-imposed strain and electrode interface configuration on the dielectric collapse in epitaxial $SrRuO_3$/BST/$SrRuO_3$ thin film capacitors. The growth mode of BST thin films was analyzed by RHEED and HRTEM from the thickness range of a few unit cells up to hundreds of nanometers where plastic strain relaxation occurs. The crystalline quality of our ultrathin samples enabled us to resolve the atomic arrangement and to identify the terminating layers at the $SrRuO_3$-BST interface by STEM. We obtained bulk-like permittivities in the order of 5000 and its thickness dependence can be well described by an extended Ginzburg-Landau-Devonshire model by taking into account plastic strain relaxation in BST thin films and finite screening of depolarizing fields by the SRO electrodes. We will furthermore present relaxor-type behavior of the BST thin films that becomes visible only in samples with sufficient interface quality and hints on nanoscale structural inhomogeneities.

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