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ABSTRACT:

Resistive Switching of Perovskite-Type Oxides Using the Hebb–Wagner Polarization Method

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Resistive switching, the change between a high-resistive OFF state and a low-resistive ON state, is well known for thin film oxides sandwiched between two ion-blocking electrodes. Herein, the possibility for resistive switching in perovskite-type oxides using the Hebb–Wagner polarization setup that uses an ion-blocking and a reversible electrode is investigated [1,2]. The resistive switching behavior is simulated numerically in terms of a defect chemical and transport model that describes the polarization of the model system $SrTiO_3$ between two different electrodes by applying an ac voltage. Corresponding experiments are also performed and the experimental results are compared with the simulation results. It is shown that the Hebb–Wagner setup allows the bulk resistive state to change not only for thin films but also for large sample thicknesses using low maximum voltage values, without the need for initially high voltages to form filaments. The effect of other parameters and phenomena on the switching behavior, like maximum voltage, surface exchange coefficient, sample thickness, and a Schottky contact between an electrode and the semiconducting oxide, is also determined. The experimental results show a high agreement with the numerical simulations, demonstrating that the Hebb–Wagner polarization setup enables bulk resistive switching of perovskite-type oxides at elevated temperatures. Finally, we compare our

results for bulk switching with our previous results on filamentary switching in polycrystalline $SrTiO_3$ [3].

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[2] N. Ahr, M. Martin, Solid State Ionics 386 (2022) 116057.
[3] D.-H. Kwon, S. Lee, C.S. Kang, Y.S. Choi, S.J. Kang, H.L. Cho, W. Sohn, J. Jo, S.-Y. Lee, K.H. Oh, T.W. Noh, R.A. De Souza, M. Martin, M. Kim, Adv. Mater. 31 (2019) 1901322.