Thermal study of multilayer resistive random access memories based on HfO 2 and Al 2 O 3 oxides

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An in-depth analysis including both simulation and experimental characterization of resistive random access memories (RRAMs) with dielectric stacks composed of two layers of HfO 2 and Al 2 O 3 stacked in different orders is presented. The simulator, which includes the electrodes in the simulation domain, solves the 3D heat equation and calculates the device current. The results are employed to analyze thermal effects in bilayer HfO 2 and Al 2 O 3 -based RRAMs with electrodes of Ni and Si-n + during resistive switching (RS) operation. According to simulations and the experimental data, the narrow part of the conductive filaments (CF) is formed in the HfO 2 layer in all the cases, and, therefore, no important differences are found in terms of reset voltage if the oxide stack order is changed with respect to the electrodes. This result is attributed to the fact that the heat flux in Al 2 O 3 is higher than in the HfO 2 layer and this determines the thermal behavior and R