Nb_2O_5 저항의 switching 특성평가

Voltage induced resistive switching of Nb_2O_5

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Abstracts

Recently, binary oxides, such as, Zr-oxide, Fe-Oxide, Ni-oxide, and so on, have been attracted for its physical interests and applications for memory. One of these materials, we have investigated the ground state properties of Nb_2O_5 at different temperature from 2 K to room temperature. Nb_2O_5 has different ground states depending on the sample environments. We have found that the set voltage is much smaller than the reset voltage. There is no forming process, which is a necessary and sufficient condition for this kind of material. On the other hand, we also found the similar behavior like other binary oxides as the set voltage is smaller than that of a reset voltage in the case of another junction in the same batch. This is consistent with the result at low temperature. The current level of the set state at low temperature is smaller than at room temperature, which is consistent of the temperature dependence of the resistivity of a metallic material. And the current level of the reset state at low temperature is higher than at room temperature, which is typical temperature dependence of resistivity of a semiconducting material. This shows that the Nb_2O_5 is semiconducting state before it undergoes a forming process and it becomes a metallic state after forming process. It also shows that the forming process make conducting path in semiconducting state. In our experiments, we have found that the forming process makes conducting paths in the semiconducting state, but the mechanism of forming

conducting path is under study and is in controversy

Key Words: Nb_2O_5, Resistivity Switching, ReRAM