

Resistance Switching Characteristics of Metal/TaOx/Pt with Oxidation degree of metal electrodes

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In this study, we investigated the effect of electrodes on resistance switching of TaOx film. Pt, Ni, TiN, Ti and Al metal electrodes having the different oxidation degree were deposited on TaOx/Pt stack. Unipolar resistance switching behavior in Pt or Ni/TaOx/Pt MIM stacks was investigated, but bipolar resistance switching behavior in TiN, Ti or Al /TaOx/Pt MIM stacks was shown. We investigated that the voltage dependence of capacitance was decreased with higher oxidation degree of metal electrodes. Through the C-V results, we expected that linearity (α) and quadratic (β) coefficient was reduced with an increase of interface layer between top electrode and Tantalum oxide. Transmission Electron Microscope (TEM) images depicted the thickness of interface layer formed with different oxidation degree of top electrode. Unipolar resistance switching behavior shown in lower oxidation degree of top electrode was expected to be generated by the formation of the conducting path in TaOx film. But redox reaction in interface between top electrode and Tantalum oxide may play an important role on bipolar resistance switching behavior exhibited in higher oxidation degree of top electrode. We expected that the resistance switching characteristics were determined by oxidation degree of metal electrodes.