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Microwave Annealing in Ag/HfO2/Pt Structured ReRAM Device

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Resistive-change random access memory (ReRAM) device is one of the promising candidates owing to its simple structure, high scalability potential and low power operation. Many resistive switching devices using transition metal oxides materials such as NiO, Al2O3, ZnO, HfO2, TiO_2, have attracting increased attention in recent years as the next-generation nonvolatile memory. Among various transition metal oxides materials, HfO2 has been adopted as the gate dielectric in advanced Si devices. For this reason, it is advantageous to develop an HfO2-based ReRAM devices to leverage its compatibility with Si. However, the annealing temperature of these high-k thin films for a suitable resistive memory switching is high, so there are several reports for low temperature process including microwave irradiation. In this paper, we demonstrate the bipolar resistive switching characteristics in the microwave irradiation annealing processed Ag/HfO2/Pt ReRAM device. Compared to the as-deposited Ag/HfO2/Pt device, highly improved uniformity of resistance values and operating voltage were obtained from the micro wave annealing processed HfO2 ReRAM device. In addition, a stable DC endurance (>100 cycles) and a high data retention (>104 sec) were achieved.

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