The crystallization behavior and interfacial reaction of Ge2Sb2Te5 thin films between dielectric material for the application to the phase change memory

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Flash memory is a widely used non-volatile memory. But flash memory has a low write time, and a limited write endurance. Recently the Ge-Sb-Te(GST) alloy material has been investigated in phase change memory(PCM), which is a new non-volatile memory based on silicon process. The phase of Ge2Sb2Te5 alloy changes reversibly and quickly, between amorphous state and polycrystalline state. There is a large difference in electrical resistance between two states. Amorphous state has high resistance and polycrystalline state has low resistance. This different resistance of GST thin film could be applied for the PCM.

The GST film was deposited on SiO2, Si3N4 and TiN by D,C. magnetron sputtering method with a GST alloy target. After the deposition of GST film, Al and Pt were deposited as a capping layer to avoid surface oxidation and observe the interface reaction between GST film and capping layer. Deposition sample was annealed in furnace and RTP. For watching crystallization behavior, XRD analysis was performed. In addition, the sheet resistance was measured by using four point probe. TEM analysis was performed to observe interface reaction between GST thin film and dielectric materials and electrode materials.

Figure 1 is the results of sheet resistance annealed in furnace as a function of annealing temperature. As shown this figure, sheet resistance drastically decreased at 175℃.This result means that crystallization temperature exists at between 175℃ and 200℃. And XRD analysis data of furnace annealed sample was included in figure 2. In As-deposited sample, there is no detectable peak. and as increase annealing temperature above 200℃, the peak of cubic and hexagonal is detected.

The interfacial reaction between GST film and dielectric material and electrical property of PCM will be discussed.

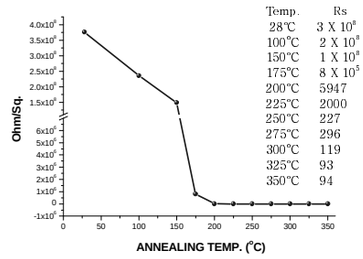

figure 1

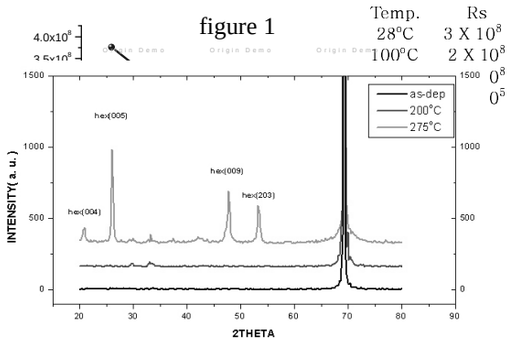

figure 2

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