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Effect of Metallic Tungsten Concentration on Resistance Switching Behavior of Sputtered W-doped NbOx Films

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In this study, we investigated that the resistance switching characteristics of W-doped NbOx films with increasing W doping concentration. The W-doped NbOx based ReRAM devices with a TiN/W-doped NbOx/Pt/Ti/SiO₂ were fabricated on Si substrates. The 50 nm thick W-doped NbOx films were deposited by reactive dc magnetron co-sputtering at 400°C and oxygen partial pressure of 35%. Micro-structure of W-doped NbOx films and atomic concentration were investigated by XRD, TEM and XPS, respectively. The W-doped NbOx films showed set/reset resistance switching behavior at various W doping concentrations. The process voltage of set/reset is decreased and whereas the initial current level is increased with increasing W doping concentration in NbOx films. The change of resistance switching behavior depending on doping concentration was discussed in terms of concentration of metallic tungsten of oxygen of W-doped NbOx.

Keywords: NbOx, Resistance switching