Influence of Rf Power In Copper Sputtering Plasma Measured By Optical Emission Spectroscopy

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Abstract

Copper oxide is a p-type semiconductor oxides material that has potential applications in solar energy devices, gas sensor applications and superconductors. Many works have been done to investigate the gas sensing properties of copper oxide based compounds. Several techniques have been used to fabricate copper oxide films, such as sol-gel synthesis, molecular beam epitaxy growth and reactive magnetron sputtering deposition. In general, the sensing properties are very much dependent on the physical and electrical properties of copper oxide films. Therefore, in order to increase the sensitivity of the copper oxide gas sensor, study on the fundamental plasma properties during the deposition on copper oxide thin films is important. In this study, optical emission spectroscopy is used to investigate the reactive magnetron sputtering plasma during the deposition of copper oxide thin film. The measurement point was focused at roughly 2cm above the substrate holder. The emission of copper, oxygen and argon in the reactive magnetron sputtering were observed at various plasma conditions. In pure Ar discharge condition, the emission intensities of copper and argon increased with the discharge RF power. The copper emission intensity was found increased when 4 sccm of oxygen flow rate was introduced into the sputtering plasma. This result suggests that a higher deposition rate could be achieved at this condition. However, the copper emission intensity decreased when the oxygen flow rate was increased to 8 and 16 sccm. In addition, oxygen emission intensity was not observed at 0 and 4 sccm of oxygen flow rate. The oxygen emission intensity was almost unchanged with the RF power