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Electrical and Structural Properties of Copper Thin Films Deposited by Novel RF Magnetized Plasma Sputtering with Gyratory Square-Shaped Arrangement by Bar Permanent Magnets MD AMZAD HOSSAIN, YASUNORI OHTSU, Graduate School of Science and Engineering, Saga University, Japan — Rotating square-shaped arrangement by bar permanent magnets has been proposed for uniform target utilization in high-density radio frequency (RF) magnetized sputtering plasma. In this work, copper thin films are grown on unheated Si wafer by RF sputtering technique. The experiments are done in stainless-steel cylindrical vacuum chamber with outer diameter of 235 mm, inner diameter of 160 mm and 195 mm in height, whereas argon (Ar) gas pressure of 1.03 [Pa], rotating the iron yoke with speed of 40 [rpm,] sputtering time of 1.5 [h], and RF input power of 100 [W] at 13.56 [MHz] are realized. The deposited copper film thickness, electrical, structural properties and plasma density are investigated for case (a) without iron cover and case (b) with iron cover, respectively placed on the contact zone between the N-pole and the S-pole magnets. Radial profiles of the deposited copper thin film thickness and resistivity for case (b) are more uniform than case (a). It is found that the resistivities of deposited copper thin film for case (a) and (b) are approximately $7.8910^{-8}\,\Omega$-m and $4.3310^{-8}\,\Omega$-m, respectively at r = 30 mm. From AFM analysis, the uniformity of thin films grown throughout surface is better case (b) than case (a). The roughness of radial profile of the film thickness for case (a) and case (b) are 22.3% and 6.55%, respectively.

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