Growth of a Cu(Co) film by underpotential deposition of Co and controlling the time of the surface-limited redox replacement of Cu

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Alternating between the underpotential deposition (UPD) of Co and surface-limited redox replacement (SLRR) of Cu enables the growth of a Cu(Co) film in a layer-by-layer manner. The technique is essential for fabricating Cu interconnects in nano-sized microelectronics. This work presents a technique to control the composition of a Cu(Co) film by controlling the time of the open circuit potential (OCP) during the SLRR of Cu because a longer OCP time results in a greater replacement of the UPD-Co by Cu²⁺. The results of this work further show that the addition of H₃BO₃ to the Co electrolyte enhances the deposition of UPD-Co without the formation of Co(OH)₂. The crystalline structure of the resultant film is examined by X-ray diffraction to confirm the formation of the Cu(Co) film. The effect of the addition of H₃BO₃ to the Co electrolyte on the formation of the Cu(Co) film via the proposed process is demonstrated.

Keywords: Cu(Co) film, underpotential deposition, surface-limited redox replacement, Cu interconnections

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