

Pd deposited by atomic layer deposition on TaN substrate and Cu fill-up of the damascene structure using electroless deposition

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Because of the gap filling capability, many researchers have studied Cu electrochemical plating and electroless plating. Electroless deposition (ELD) of Cu already used in electronic packaging, and in the fabrication of Cu on-chip interconnects to fill features. Cu ELD typically requires a catalytic surface to oxidize the reducing agent. Typical catalytic materials are platinum(Pt), palladium(Pd), silver(Ag), gold(Au), rhodium(Rh), or iridium(Ir), where Pd is preferred. In this work, we have deposited Pd by atomic layer deposition, and then we have to deposit Cu by electroless plating. The blanket and patterned TaN of 10 nm thick was obtained from Intel with the size of 130 nm and aspect ratio of 2. Palladium film of 3 nm was deposited on TaN by atomic layer deposition. Chemicals were used in ethylenediaminetetraacetic acid (EDTA) as chelating agent, glyoxylic acid as a reducing agent, and additional chemicals such as RE-610 and 2,2'-dipyridine is surfactant and stabilizer individually. The pH of bath was adjusted ~12.5 with tetramethylammonium hydroxide (TMAH). The solution temperature was maintained at 65°C. There has been success the super-filling and fill-up on TaN.