Self-annealing effect of electrolessly deposited copper thin films based on Co(II)-ethylenediamine as a reducing agent

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Self-annealing of electrolessly deposited copper films has been investigated for different thicknesses on blanket TiN wafers. Decrease of 60% to 90% in the sheet resistances of 100-260 nm thick copper films was observed after self-annealing. Changes in the copper films' microstructure were also investigated, including the enhancement of their (111) orientation and grain growth. The pinning of chlorine was found to be influential for self-annealing and Pd activation for electroless deposition played an important role in self-annealing as to microstructural dislocations and defects. In addition, the thinner copper film was more affected by self-annealing. After deposition at room temperature, elevated temperatures accelerated self-annealing and caused decreases in resistivities. The resistivity of a 260 nm thick copper was reduced to 1.7μΩ·cm at 70°C.