

TaN_x 박막의 Cu 확산방지특성
TaN_x diffusion barrier properties against copper diffusion into silicon

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Cu is promising material for the future interconnection in Si-based integrated circuits due to its lower resistivity and better electromigration resistance as compared to aluminum.¹ However Cu is very mobile in Si at elevated temperature and creates the deep trap levels that degrade device reliability.² To solve this problem many materials such as refractory metals, intermetallic alloys, or compounds, nitrides, and ternary metal-Si-N amorphous alloys. Among these, Ta nitride is one of important candidate because of its chemical inertness with Cu.³

In this study reactively sputtered TaN_x thin films have been investigated as a diffusion barrier between Cu and Si. By changing the ratio of N₂ to Ar + N₂ gas flow rate at a total pressure of 5mTorr with RF power of 300W, 30nm TaN_x films with different composition were deposited. Cu was deposited successively without breaking vacuum after deposition of TaN_x. The thickness of the Cu films was 100nm. There was no additional substrate heating during deposition. Prepared films were annealed at temperatures ranging from 500°C to 750°C for 1h in 10% H₂/Ar forming gas ambient. Barrier properties, before and after annealing were examined by sheet resistance measurement, XRD, RBS, SEM. From these results comparisons of barrier properties between amorphous and crystalline structures of TaN_x films were established.

Reference

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