

Fabrication and thermal stability of W, WN_x diffusion barriers in the low-k integration structure

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The Cu/barrier/low-k SiCOH structures were fabricated and their thermal stability was investigated. SiCOH films were deposited by plasma-enhanced chemical vapor deposition using divinyl dimethylsilane (DVDMS) and O₂. As barrier materials, tungsten and tungsten nitride films were deposited by chemical vapor deposition (CVD) using W(CO)₆ and NH₃ sources at 450 °C. Variations of SEM and XRD results of Cu/barrier/low-k SiCOH were examined depending on the annealing temperature. Both results showed that W and W₂N film blocked the Cu diffusion up to 500 °C and above 600 °C, WO₃ nanorods were grown from the sample surface. It is thought that the thermal stability of the Cu/barrier/SiCOH/Si structure is closely related with the thermal destruction of the low-k SiCOH films.