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Plasma Etching: Dielectric Materials

"Effects of CH₂F₂ Addition on a High Aspect Ratio Contact Hole Etching in a C₄F₆/O₂/Ar Plasma"

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The profile / CD control and resist selectivity for etching of 0.17 μ m contact holes (TEOS, DUV resist) with 15:1 aspect ratio were studied as a function of CH₂F₂ addition to a C₄F₆ based chemistry. The experiments were performed in a MERIE reactor at 45 mTorr, 1800 W, 100 G. SEM cross sections show a thicker fluorocarbon passivation film for the CH₂F₂ added chemistries. A reduction in sidewall bowing is observed when the CH₂F₂ flow was increased. For a flow of 20 sccm CH₂F₂, sidewall bowing is virtually absent and the resist selectivity is increased from 3.8 to 5.8. XPS analysis shows that the fluorocarbon films on oxide were carbon-rich in the presence of CH₂F₂ gas.