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Study of a Charging Voltage during SiO₂ Etching in a 2f-CCP
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ABE — Top-down plasma micro/nano processing is increasingly important for a
continuous development of ultra large scale integrated (ULSI) circuits. In particu-
lar, etching of contact holes through SiO₂ film to Si layer is a crucial process for the
fabrication of multilayer interconnects. SiO₂ etching processes of high-aspect-ratio
contact hole (HARC) have caused serious problems due to a local charge accumula-
tion inside a deep contact hole, considered as one of the origins of plasma-induced
damages. A surface conduction considered as one of possible mechanisms for re-
ducing the charge accumulation at the bottom of a contact hole irradiated to SiO₂
etching in fluorocarbon gas chemistry is investigated by using both experimental
and numerical techniques. The dependence of the charging potential on a biasing
voltage obtained by a simulation gives a quite different behavior from that by the
experimental result. Under the assumption that the discrepancy is mainly caused by
the surface conduction on the sidewall due to C_xF_y polymer deposition, the optimal
value of surface conductivity can be estimated.

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