

Thin Film Formation by RF Sputtering Deposition and Its Application to MOS Device Fabrication

Toshiaki Yachi

September, 1986

Thin film formation by RF sputtering deposition and its application to further size reduction in MOS devices are described. The following results are discussed.

(1) SiO_2 , Ti-Si, Al films and thin multilayers were deposited by RF sputtering. The SiO_2 film properties changed markedly depending on the sputtering conditions, especially the sputtering pressure and gas (argon/hydrogen) composition. Of high significance, a thin multilayer having a 3nm bilayer thickness was also fabricated by simultaneous RF planar magnetron sputtering from two independent targets.

(2) Self-alignment patterning was achieved utilizing RF sputtering deposition. Beyond that, liftoff patterning of sputtered SiO_2 films (LOPAS), for realizing self-alignment field isolation, was accomplished by employing to selectively etch films on the photoresist side walls. Additionally, a Si_3N_4 film self-alignment liftoff technique for selective oxidation (SALTS) was developed. Furthermore, TiSi_2 self-alignment formation in the source/drain region and the gate electrode has been realized utilizing Ti-silicide RF sputtering deposition and its subsequent oxidation.

(3) High performance MOS devices with high packing density and switching speed were fabricated using the LOPAS isolation, the SALTS for self-alignment contacts and the TiSi_2 self-alignment source/drain region and gate electrode formation. These devices show no deterioration in MOS characteristics.