453b The Removal of Ion-Implanted Photoresist from Microelectronic Devices Using Supercritical Carbon Dioxide

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Advanced CMOS devices for the 45 nm node and beyond require high drive currents and ultra shallow junctions to satisfy the circuit specification in terms of speed and static leakage. Influence of silicon recess and dopant consumption while stripping photoresists used for fabrication of source/drain extension on junction profile has become critical. Currently, oxygen plasma ashing followed by sulfuric acid/hydrogen peroxide processing has been used for the photoresist stripping. Silicon dioxide formed with such plasma and chemical oxidation process is etched off by the subsequent cleaning step with SC1, causing silicon recess of ultra shallow junction, as shown in Fig.1. To avoid the silicon recess, photoresist removal processes without the use of oxidizing species are required. In this study, we have successfully shown that with supercritical carbon dioxide/co-solvent formulations, efficient stripping of ion-implanted photoresists can be achieved while avoiding silicon recess and dopant consumption in the fabrication of ultra shallow junction of CMOS transistors. Photoresist removal using supercritical fluid is also environmentally benign and thus it is applicable to numerous photoresist-stripping steps in the fabrication of CMOS transistors.