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Numerical and Experimental Investigations of Plasma Etching and Deposition Processes applied in STI STEFAN TINCK, ANNEMIE BOGAERTS, University of Antwerp, PLASMANT RESEARCH GROUP TEAM — The etching of Si with an $Ar/Cl_2/O_2$ inductively coupled plasma (ICP) and the deposition of SiO_2 with an $Ar/SiH_4/O_2$ ICP as applied in shallow trench isolation (STI) will be discussed. Experimental and modeling results are compared for a better understanding of these processes. Special attention will be paid to the plasma surface interactions on the Si substrate and the reactor walls and how these surface processes influence the properties of the plasma. During the trench etching of Si with an $Ar/Cl_2/O_2$ ICP, etched or sputtered $SiCl_xO_y$ species will be loaded into the plasma, can redeposit onto the reactor walls and can eventually redeposit onto the substrate again, altering the resulting etch/deposition process. To gain better understanding of these loading effects, a model is applied to calculate the general plasma properties, the fluxes of etched/sputtered species loaded into the plasma and redeposition of these species onto the reactor walls. For this, a bulk plasma reaction set and a surface-chemistry reaction set are used simultaneously during the simulations. Etch and deposition rates predicted by the model are compared with experimental data.

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