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Investigation of the etching mechanisms of Ar/Cl_2/O_2 inductively coupled plasmas on silicon by means of modelling and experiments STEFAN TINCK, University of Antwerp — In this topic, the etching behaviour of Cl_2/O_2/Ar inductively coupled plasmas on a silicon substrate, as used in shallow trench isolation for the production of electronic devices, is investigated by means of modelling and experiments. A hybrid plasma model is applied to calculate the plasma characteristics in the reactor chamber and two additional Monte Carlo simulations are performed to predict the fluxes, angles and energy of the plasma species bombarding the silicon substrate, as well as the resulting surface processes such as etching and deposition. Experimentally, it is found that when the fraction of oxygen in the gas mixture of the plasma is too high, the deposition of oxygen species becomes superior to the etching of silicon by chlorine species, resulting in an etch rate close to zero. In the surface simulations, special attention is paid to the potential distribution and the composition of the surface layers during etching or deposition to provide a better insight in these silicon surface processes.

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