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Global model of low-pressure Cl_2/Ar inductively coupled plasma

ROMAIN CHANSON, CNRS Institut des Materiaux Jean Rouxel, NICOLAS VAISSIÈRE, AHMED RHALLABI, Institut des Materiaux Jean Rouxel, CHRISTOPHE CARDINAUD, MARIE CLAUDE PEIGNON, CNRS Institut des Materiaux Jean Rouxel, SOPHIE BOUCHOULE, CNRS Laboratoir de Photoniques et de Nanostructures — Nowadays, plasma processes represent one of the keys for the integration enhancement of electronic and optical devices. Indeed, it is now possible with plasma etching process using an inductive coupled plasma (ICP) to transfer nanometer scale patterns from the mask to the substrate. The success of the high aspect ratio pattern transfer without geometrical defects (bowing, undercut, trenching,..) is tributary of a good understanding of the physical and chemical mechanisms of the plasma discharge and the surface kinetics processes. In this context, a gas phase kinetic model has been developed to study the transport of charged and neutral species created in Cl_2-Ar ICP plasma discharge. The model is 0D and it is based on the resolution of the differential equations associated to the mass balance equations of produced species in a reactor coupled to the both neutrality equation and power balance equation. The model allows to determine the densities of charged and neutral species and electron temperature as a function of operating conditions. A satisfactory agreement between the simulation and experiment concerning the electron temperature and electron density is obtained.

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