Abstract Submitted
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A complete simulation of InP etching by Cl2/N2/Ar plasma mixture[1] ROMAIN CHANSON, AHMED RHALLABI, MARIE CLAUDE FERNANDEZ, CHRISTOPHE CARDINAUD, Institut des Materiaux (IMN) - University of Nantes, PLASMAS COUCHES MINCES TEAM — Deep anisotropic plasma etching of InP is an indispensable tool for the fabrication of a large variety of integrated optical devices. In this context, a 2D Monte Carlo etching model of InP by a Cl2/Ar/N2 plasma discharge coupled to a global kinetic plasma model and a sheath model have been developed. It allows the prediction of the geometrical and chemical profile of trenches etched through the mask versus the operating conditions. The plasma kinetic model is performed to quantify the reactive species densities and fluxes such as those of Cl, N and positive ions. The latter are introduced as the input parameters in the etching model. Under Cl2/Ar plasma mixture, the mechanism of the development of bowing defect is mainly attributed to the chemical etching of the adsorbed sites InClx. The impact of nitrogen addition into the Cl2/Ar gas mixture is studied. Both the simulations and the experiments show the role of the nitrogen on the disappearance of the bowing defect. This is attributed to the passivated layer due to the formation of InClxNy species. For a moderate nitrogen proportion, the passivated layer is mainly composed of InNCl2 and InNCl sites at the top of the InP etched trenches while at the bottom, the passivated layer is mainly composed by InN sites.

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