

Effect of phosphine plasma treatment on protection from Si passivation in AlInAs/InGaAs HEMT due to F atoms

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Abstract

A process technology to suppress diffusing fluorine (F) atoms into the AlInAs layer at elevated temperature is investigated using AlInAs/InGaAs HEMT wafers grown on InP substrates. Removal of F atoms adsorbed on the AlInAs surface and formation of a barrier layer to suppress F diffusion are attempted by a plasma process. It is demonstrated by SIMS measurements that diffusion of F atoms is suppressed even after annealing at 400 °C for the AlInAs layer treated successively with phosphine plasma at room temperature and 250 °C. Hall measurements also reveal that a reduction in the two dimensional electron gas density is suppressed.