REACTIVE NITROGEN SOURCE BASED ON ECR DISCHARGE SUSTAINED BY GYROTRON RADIATION

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In recent years, A3B5 compounds have become very popular due to its unique properties. Heteroepitaxy films capture the attention because of their possibility to use for the effective optoelectronic devices and electronic microwave devices. The most interesting compound A3B5 group is indium nitride (InN). It has a narrow bandgap and a high electron mobility, may be used to create solar panels and infrared lasers [1].

The only way to get an InN is an epitaxial growth. High quality heteroepitaxial indium nitride films can be produced by the molecular beam epitaxy. A source of active nitrogen is required for this method.

Using gyrotron as a microwave source with high frequency and power provides an additional opportunity to control the flow of activated nitrogen. Active nitrogen flow is determined by parameters of the plasma. Measuring atomic nitrogen source parameters is needed to make the best conditions for the epitaxial growth [3].

In this paper presents the results of the atomic nitrogen source parameters measurement based on electron cyclotron resonance plasma (ECR) discharge, which is supported by microwave radiation with frequency of 24 GHz. Atomic nitrogen flow was measured by mass spectrometric analysis of the products of the reaction between active nitrogen and nitrogen monoxide [4].

2N + 2NO → 2N2 + O2

The amount of atomic nitrogen was measured by reduction of the amount nitrogen monoxide, when the microwave source is switched off - no flow of atomic nitrogen and no reaction nitrogen monoxide with atomic nitrogen. The atomic nitrogen flow up to 4·1018 pcs/sec was demonstrated.

Electron temperature and concentration was measured by Langmuir probe. It has been shown that the electron temperature decreases with increasing molecular nitrogen flow. Main parameter affecting the electron density in the growth zone is microwave power.

References

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