METHODS OF PLASMA ACTIVATION OF NITROGEN FOR THE NITRIDE COMPOUNDS GROWTH

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Since a few years, metal nitride compounds from the third group (A3N) have attracted great interest of researches. A3N have the wide range of band gap energy 0.6–3 eV and high electron mobility, which make it ideal for high efficiently solar cells, light-emitting diodes and electrical devices for THz emission [1]. The main problem of growth A3N concerned with its thermal decomposition. So plasma-assisted molecular beam epitaxy (MBE) is a suitable method for producting A3N, because low growth temperatures are possible. The aim of this work is investigate and compare methods of nitrogen activation by electron cyclotron resonance (ECR) discharge at a frequency of 24 GHz [2] and induction heating at a frequency of 13.56 MHz. Methods efficiency in the power range 200–400 W was evaluated by measuring the vibrational temperature of nitrogen, concentration and temperature of the electrons. In addition, the flow of reactive nitrogen was evaluated. It was shown that all the measured plasma parameters on both sources of reactive nitrogen are the same within the error. Therefore, both methods are equally effective in the power range from 200 W to 400 W. The flow of reactive nitrogen was 2 × 1019 pcs/sec.

References

1. M. Sato, “Epitaxial Growth of InN by Plasma-Assisted Metalorganic Chemical Vapor Deposition,” *Jpn. J. Appl. Phys.*, vol. 36, no. Part 2, No. 5B, pp. L595–L597, May 1997.
2. A. Vodopyanov and D. Mansfeld, “Reactive nitrogen source based on ECR discharge sustained by 24 GHz radiation,” Jpn. J. Appl. Phys., vol. 54, no. 4, p. 040302, 2015.