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Growth of Wurtzite and Zinc-Blende Phases in III-N Semiconductors by Molecular Beam Epitaxy

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ABSTRACT

In this presentation, we delve into the intricacies of synthesizing III-N semiconductor materials using Molecular Beam Epitaxy (MBE). MBE, renowned for its precision in depositing material at the atomic layer level, is an ideal technique for fabricating heterostructures and nanostructures.

During the first part of our discussion, we present the outcomes of growing wurtzite III-N structures on Si(111) substrates using MBE, with the aid of a radio-frequency (RF) plasma source to generate reactive atomic nitrogen. In the latter segment, we offer insights into the growth of III-N semiconductors on GaAs (100) substrates to induce the formation of the zinc-blende phase. We emphasize the methodology employed to meticulously control the early stages of heteroepitaxy, ensuring a substantial cubic phase content in the resultant GaN. Throughout our presentation, we explore the optical, electrical, and structural properties of nanostructures and heterostructures of III-N semiconductors in both wurtzite and zinc-blende phases. This discussion promises to illuminate the nuances of III-N semiconductor growth via MBE, shedding light on the intricacies of crystal phases and their potential implications for future device technologies.