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Process Optimization of GaN Nanorods Fabricated Using CH4/H-2/SF6 Inductively Coupled Plasma Etch Technology

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Abstract

We developed a new etch process for GaN and related materials, which utilizes CH4/H-2/SF6 plasma. This kind of plasma is both less toxic and corrosive than that based on chlorine containing plasmas. Firstly, conventional CH4/H-2/Ar plasma was investigated by varying the CH4/H-2 ratio. Although a smooth surface of the etched nanorods is obtained using this plasma, the deposition of carbonated polymer films on the surfaces caused by this plasma resulted in a low etch rate. Interestingly, more control of this carbonated film deposition has been achieved by adding SF6, which in turn resulted in a relatively high etch rate and well aligned nanorods. Thus, this top-down method could be potentially used in processing of advanced devices like laser diodes, light emitting diodes, and three dimensional transistors.

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