

MICRON SIZE AIR HOLE FORMATION IN GaN USING REACTIVE ION ETCHING (RIE) AND MOCVD

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Photonic crystal surface-emitting lasers (PCSELS) utilize periodic air-hole lattices to establish optical feedback at Bragg conditions, enabling coherent, large-area vertical emission. Air-hole geometry and filling factor control the vertical radiation loss and surface emission thus hole formation and overgrowth are significant manufacturing steps. Furthermore during subsequent sophisticated MOCVD epitaxial lateral overgrowth, these etched openings define nucleation sites, influencing crystal morphology and the coalescence dynamics of the overgrown GaN layers.

We performed UV laser lithography parameter optimization to achieve the smallest features. Subsequently, micron-sized hole patterns were transferred into the GaN layer by $\text{Cl}_2/\text{BCl}_3/\text{Ar}$ plasma reactive ion etching (RIE).

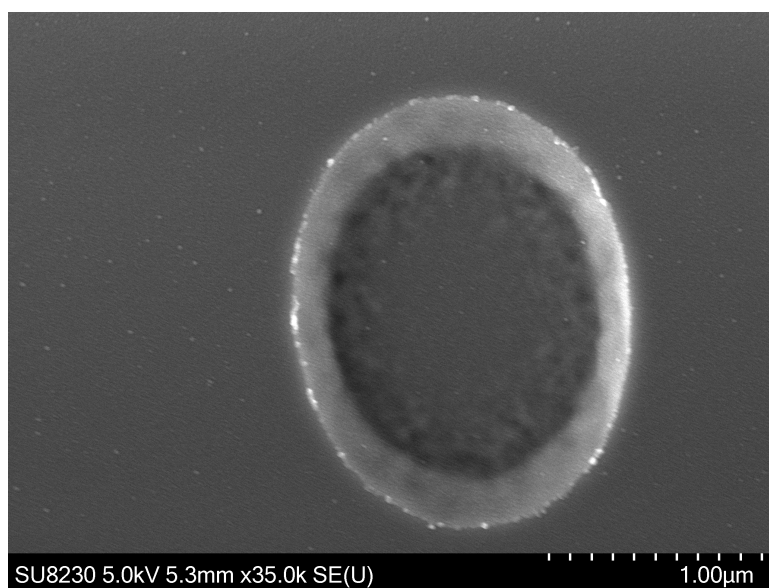


Fig. 1. Achieved micron-sized hole, transferred into GaN layer with RIE.

Further work will focus on optimizing the epitaxial lateral overgrowth process.