

A Novel Fabrication Method for III-Nitride Air-Bridge Photonic Crystals

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Successful fabrication of III-nitride air-bridge PC nanocavity by a novel technique is reported. Self-assembled GaN/AlN QDs were grown on a 6H-SiC (0001) substrate by low-pressure MOCVD. Following electron-beam lithography and reactive ion etching, photoelectrochemical etching of SiC was employed to partially lift-off the epitaxial layer, which subsequently relaxed compressive strain and formed a convex air-bridge structure (Fig. 1). Successful transfer of fine patterns was accompanied by unintentional hexagonal shape of holes, which was attributed to crystallographic orientation-dependent chemical reactions (Fig. 2). For the lowest-order cavity modes of an L7 nanocavity ($a = 150$ nm), Q-factor of more than 2,400, the highest Q for nitride-based PC nanocavities, is achieved (Fig. 3).

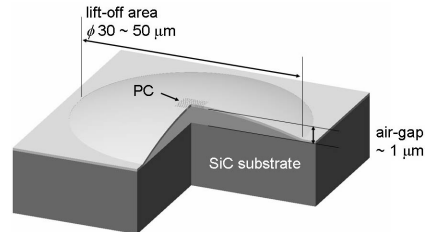


Fig.1 A schematic illustration of an AlN air-bridge photonic crystal

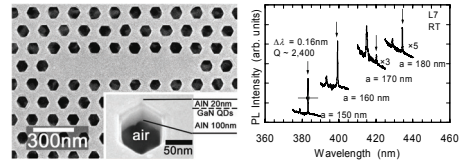


Fig.2 SEM images of an AlN PC

Fig.3 μ -PL spectra of AlN PCs