Realization of New type of light Emitters in the Deep-Ultraviolet Region through AlGaN Nitride Semiconductor

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ABSTRACT

Research in the deep-ultraviolet (DUV) region in the electromagnetic spectrum is gaining momentum owing to its several notable applications such for biological detection, water purification, sterilization and next-generation high-density storage. For these applications, Al(Ga)N is the promising material because its emission can be controlled down to 200 nm. However, obtaining high-quality epilayer free from any growth defects remains a big challenge and the heteroepitaxial growth, where the fabrication of this device is normally performed, aggravates the problem due to the generation of defects that degrades the radiative properties of the device. Here, we report the successful fabrication of high-quality AlN and $Al_xGa_{1-x}N$/AlN (x>0.69) multiple quantum wells (MQWs) by modified migration enhanced epitaxy (MEE) and demonstrate their high optical radiative properties. The high-quality AlN and AlGaN was successfully achieved through the effective control of the initial nucleation during growth, paving the way for the realization of DUV emitters which is compact, has long lifetime and environmentally-friendly.