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Investigation of AlGa_N UV emitting LED devices by off-axis electron holography

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Abstract

Here we use off-axis electron holography combined with advanced transmission electron microscopy techniques to understand the opto-electronic properties of AlGa_N Tunnel Junction-LED devices for UV emission. Four identical AlGa_N LED devices emitting at 290 nm have been grown by metal-organic chemical vapour deposition. Then different Ge doped n-type regions with and without InGa_N or Ga_N interlayers have been grown by molecular beam epitaxy onto the top Mg doped p-type layer to form a tunnel junction and hence a high quality ohmic metal contact. The LED devices have been characterized using standard opto-electric techniques and the improvements in the performance of the LEDs with the tunnel junction are shown. Off-axis electron holography has then been used to demonstrate a reduction in the width of the tunnel junction from 8.5 to 5.0 nm when an InGa_N interlayers are used. To improve once all the information is written down.