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High-resolution TEM study of Mg-doped Aluminum Nitride Epilayers[1] BO CAI, MIM NAKARMI, CUNY-Brooklyn College and Graduate Center — Transmission electron microscopy (TEM) has been employed to study the threading dislocations in Mg-doped Aluminum Nitride (AlN) epilayers grown by metal-organic chemical vapor deposition. The Mg-doped AlN epilayer samples were grown on high quality AlN/Sapphire template of AlN thickness ~ 1 μm. Atomic Force Microscopy and X-ray Diffraction were employed to characterize the surface morphology and the crystalline properties respectively. In the AlN template layers, TEM revealed that the dominant threading dislocation is the edge type dislocation with the average dislocation density of screw and edge dislocation in the order of 10^7 and 10^9 cm^{-2} respectively. In this study, we present our investigation of the threading dislocations associated with Mg-doping in AlN by analyzing the plan-view and cross-section view of TEM images taken under two-beam conditions. We will also use high-resolution dark field and bright field TEM images to investigate the origin and nature of the threading dislocations. Implementation of our finding to improve the quality of Mg-doped AlN epilayers will also be discussed.

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