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Beryllium acceptor binding energy in AlN. ASHOK SEDHAIN, T. M. AL TAHTAMOUNI, JING LI, Kansas State University, JINGYU LIN, HONGXING JIANG, Texas Tech University, DEPARTMENT OF PHYSICS, KANSAS STATE UNIVERSITY COLLABORATION, NANO-TECH CENTER AND DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING, TEXAS TECH UNIVERSITY COLLABORATION — The acceptor binding energy of an alternative dopant, Be, in AlN epilayers has been probed by time-resolved photoluminescence (PL) spectroscopy. The binding energy of excitons bound to Be acceptors in AlN is determined to be about 33 meV, which implies that the Be acceptor binding energy in AlN is about 0.33 eV in accordance with Haynes' rule. The measured PL decay lifetimes of the acceptor-bound exciton transitions in Be- and Mg-doped AlN (93 and 119 ps, respectively) also indicate that the binding energy of Be acceptor is smaller than that of the most common acceptor dopant in AlN, namely, Mg. The smaller activation energy of Be in AlN has the potential to partly address the critical p-type doping issue in AlN- and Al-rich AlGaN by increasing the room temperature free hole concentration by $\sim 10^3$ compared to the case of Mg doping.

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