Abstract Submitted
for the OSS05 Meeting of
The American Physical Society

Electrical properties of $Al_xGa_{1-x}N$ implanted with Si at low doses
ELIZABETH MOORE, TIMOTHY ZENS, Air Force Institute of Technology, MEE-YI RYU, Kangwon National University, YUNG KEE YEO, JAMES FELLOWS, ROBERT HENGEHOLD, Air Force Institute of Technology — The investigation of ion implanted $Al_xGa_{1-x}N$ is still an immature subject compared to the research that explores the properties of GaN. A systematic electrical activation study of Si implanted $Al_xGa_{1-x}N$ grown on sapphire substrates by molecular beam epitaxy has been made as a function of ion dose and anneal temperature. Silicon ions were implanted at 200 keV with does ranging from 1x10^{13} to 1x10^{14} cm^{-2} at room temperature. The samples were proximity cap annealed from 1100 to 1350 ^oC with a 500 Å AlN cap in a nitrogen environment. Hall Effect measurements show that an electrical activation efficiency of almost 100% can be obtained for the $Al_{0.2}Ga_{0.8}N$ implanted with doses of 5x10^{13} and 1x10^{14} cm^{-2} and annealed at 1350 and 1300 ^oC, respectively, for 20 min. An electrical activation efficiency of 87% was achieved for the $Al_{0.1}Ga_{0.9}N$ implanted with a dose of 1x10^{14} cm^{-2} after annealing at 1250 ^oC for 20 min. These samples also exhibited a large mobility of 89 $cm^2/V\bullet s$.

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Date submitted: 18 Mar 2005 Electronic form version 1.4