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Electrical properties of Si-implanted $Al_xGa_{1-x}N$ with high Al mole fraction ELIZABETH MOORE, Air Force Institute of Technology, MEE-YI RYU, Kangwon National University, YUNG KEE YEO, ROBERT HENGEHOLD, Air Force Institute of Technology — Ion implanted AlGaN has not been well investigated, in particular AlGaN with high Al mole fraction, compared to the research of ion-implanted GaN. Therefore, a systematic electrical activation study of Si-implanted AlGaN with Al mole fraction from 0.1 to 0.5 has been made as a function of ion dose and anneal temperature. The AlGaN wafers were grown on sapphire substrates by migration enhanced metal organic vapor deposition. Silicon ions were implanted at 200 keV with doses from 1x10^{14} to 1x10^{15} 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. The results of Hall Effect measurements show that electrical activation efficiencies of 77% and 53% were obtained respectively for the $Al_{0.4}Ga_{0.6}N$ and $Al_{0.5}Ga_{0.5}N$ implanted with a dose of 1x10^{15} cm^{-2} and annealed at 1350 for 20 min. The $Al_{0.1}Ga_{0.9}N$ samples exhibited a mobility of 100 $cm^2/V\bullet s$, while the $Al_{0.5}Ga_{0.5}N$ showed a mobility of half that value. It has been found that the samples with higher Al mole fraction generally require a higher anneal temperature and/or longer anneal time for a better electrical activation. Also, the mobility of the sample was found to decrease as the Al mole fraction increases.

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