Abstract Submitted
for the GEC15 Meeting of
The American Physical Society

Measurement of absolute density of N atom in sputtering plasma for epitaxial growth ZnO films via nitrogen mediated crystallization[1] TOMOAKI IDE, KOICHI MATSUSHIMA, TOSHIYUKI TAKASAKI, Kyushu University, KEIGO TAKEDA, MASARU HORI, Nagoya University, DAISUKE YAMASHITA, HYUWOONG SEO, KAZUNORI KOGA, MASAHARU SHIRATANI, NAHO ITAGAKI, Kyushu University — ZnO has attracted attention as a potential alternative to GaN in light emitting diodes because of the wide band gap and large exciton binding energy. Recently, we have developed a fabrication method of ZnO by sputtering, nitrogen mediated crystallization (NMC), enabling us to make epitaxial films with low defect density. By utilizing the buffer layers fabricated by NMC method, we have succeeded in fabrication of single crystalline ZnO films even on 18% lattice mismatched substrates. Here, aiming to clarify effects of nitrogen during NMC process, we measured absolute density of N atom in sputtering plasma by means of vacuum ultra violet absorption spectroscopy. First, NMC–ZnO buffer layers were deposited in Ar/N2 atmosphere. Then, ZnO films were deposited in Ar/O2 atmosphere. With increasing N2 flow rate ratio from 4 to 12%, the N density increases from 3.2×10^{10} to 1.4×10^{11} cm^{-3}. By utilizing the NMC–ZnO buffer layer fabricated at under these conditions, single crystalline ZnO films are grown. However, large number of pits are observed on the surface of ZnO films under N-rich conditions, indicating that N density is of importance in controlling the morphology of ZnO films.

[1]This work was supported in part by Japan Society for the Promotion of Science KAKENHI grant number 15H05431.

Tomoaki Ide
Kyushu University

Date submitted: 19 Jun 2015 Electronic form version 1.4