

Generation of Charged Nanoparticles in the Gas Phase and their Contribution to Deposition of GaN Films and Nanostructures during Atmospheric Pressure Chemical Vapor Deposition

Authors : Jin-Woo Park, Sung-Soo Lee, Nong-Moon Hwang

Abstract : The generation of charged nanoparticles in the gas phase during the Chemical Vapor Deposition (CVD) process has been frequently reported with their subsequent deposition into films and nanostructures in many systems such as carbon, silicon and zinc oxide. The microstructure evolution of films and nanostructures is closely related with the size distribution of charged nanoparticles. To confirm the generation of charged nanoparticles during GaN, the generation of GaN charged nanoparticles was examined in an atmospheric pressure CVD process using a Differential Mobility Analyser (DMA) combined with a Faraday Cup Electrometer (FCE). It was confirmed that GaN charged nanoparticles were generated under the condition where GaN nanostructures were synthesized on the bare and Au-coated Si substrates. In addition, the deposition behaviour depends strongly on the charge transfer rate of metal substrates. On the metal substrates of a lower CTR such as Mo, the deposition rate of GaN was much lower than on those of a higher CTR such as Fe. GaN nanowires tend to grow on the substrates of a lower CTR whereas GaN thin films tend to be deposited on the substrates of a higher CTR.

Keywords : chemical vapour deposition, charged cluster model, generation of charged nanoparticles, deposition behaviour, nanostructures, gan, charged transfer rate

Conference Title : ICMSCMP 2014 : International Conference on Material Science and Condensed Matter Physics

Conference Location : Barcelona, Spain

Conference Dates : February 27-28, 2014