

GaN 성장을 위한 이온 주입된 사파이어 기판의 효과
 Effect of ion implanted sapphire substrates for GaN

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We have implanted on sapphire substrate with various ions and investigated the properties of GaN epilayers grown on implanted sapphire substrate by metal organic chemical vapor deposition (MOCVD).

Sapphire is typical substrate for GaN epilayers. However, there are many problems such as lattice mismatch and thermal coefficient difference between sapphire substrate and GaN. The ion implanted substrate's surface had decreased internal free energies during the growth of the GaN epilayer, and the misfit strain was relieved through the formation of an AlN phase on the ions implanted sapphire(0001) substrates.[1] The crystal and optical properties of GaN epilayer grown in ions implanted sapphire(0001) substrate were improved.

These facts indicate that AlN phase decreased the elastic strain energies by lattice mismatch with the sapphire(0001) substrates, and surface roughness of the sapphire surface was related to the properties of GaN epilayer. It is obvious that the ion implantation pre-treatment of sapphire(0001) substrates can be an alternative pre-treatment procedure for GaN deposition and has the potential to improve the properties of GaN epilayer on sapphire (0001) substrates. This result implies that higher quality of GaN epilayer using ion implantation on sapphire substrate with various ions.

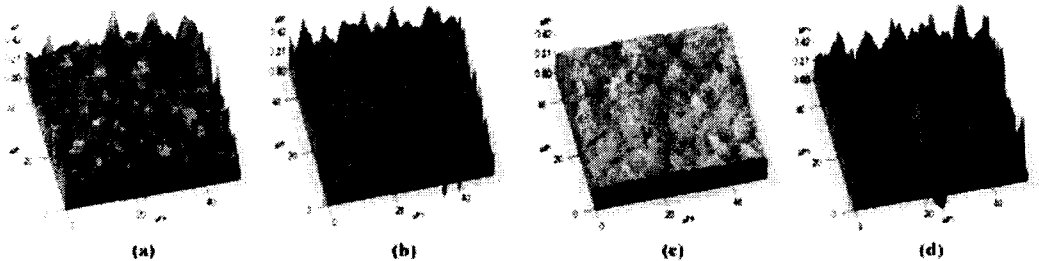


Fig. 1. AFM images of GaN epilayer on substrates with (a) N-ion implanted, (b) Ar-ion implanted, (c) Kr-ion implanted and (d) Xe-ion implanted. Their RMS roughnesses are (a) 106 nm, (b) 122 nm, (c) 12.1 nm and (d) 116 nm, respectively.

[1] Y.S. Cho, E.K. Koh, Y.J. Park, D. Koh, E.K. Kim, Y. Moon, S.-J. Leem, G. Kim and D. Byun, J. Cryst. Growth 236 (2002) 538