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DLTS analysis of defects in N-type 4H-SiC

민성지[1], 손우영[1], 아예드 후세인[2], 문정현[3], 방욱[3], 구상모[1a]
Seong-Ji Min[1], Woo-Young Son[1], Hussein Ayedh[2], Jeong-Hyeon Moon[3], Uk Bang[3], Sang-Mo Koo[1a]

[1]광운대학교
[2]University of Oslo
[3]한국전기연구원

Abstract:

SiC has superior properties such as wide band gap, high breakdown voltage and high thermal conductivity. SiC can operate under high temperature environment of 600 to 700 °C or more and it is very important material for high frequency and high voltage applications.

SiC-based power devices can be fabricated in vertical device structures all the way through substrates. For these reasons, it is essential to grow high-quality epitaxial layers and to implant dopant ions over these layers. On the other hand, there are number of known defects such as intrinsic point defects, threading dislocations and defect clusters which are generated during SiC growth or ion implantation process. These defects act as carrier trap or recombination center in the semiconductor energy band to reduce device efficiency. Also, deep level defects can contribute to defect analysis of epitaxial wafers and ion implanted structures, reliability of high current density SiC devices.

In this study, deep energy defect levels according to dopant were analyzed by DLTS measurement based on N-type 4H-SiC epi and ion implantation structures. Doping effects on N-type 4H-SiC epitaxial and ion-implanted structures were investigated. DLTS analysis of epitaxial wafers and implanted devices contributes to the reliability of SiC devices.

Keywords

DLTS analysis, defects, 4H-SiC

a. 교신저자 이메일

smkoo.kw@gmail.com