

Advanced Theory of Electron Devices

2 units (selection)

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Target Understanding of deep levels in compound semiconductor electron device performances

Outline Semiconductor device physics for the analyses and design of semiconductor electron devices will be lectured. After teaching basic concepts of band diagram and fermi levels, carrier transport theory and device operation mechanisms will be presented. Various instable phenomena, which limit the device performance, will also be presented with theoretical backgrounds. The topics include, silicon, GaAs and GaN as semiconductor materials, and MOSFET, HEMT and HBT as electron devices. The lecture items are, 1 Band diagram, 2 Electron transport, 3 Short channel effects, 4 Impurity levels, 5 Deep traps, 6 Semi-insulating substrate, 7 HEMT, 8 Side-gating effect, 9 Drain-lag and DLTS, and 10 Surface states and breakdown.

Style Lecture

Keyword *band diagram, HEMT*

Goal Draw band diagrams including deep levels in non-thermal equilibrium

Schedule

1. Band Diagram
2. Thermodynamics of Electron Transport
3. Short Channel Effects
4. Impurity Levels
5. Electrical Performance of Deep Levels
6. Semi-insulating Substrate
7. Hetero Junction Transistors
8. Side-Gating Effect
9. Drain Lag and DLTS
10. Surface States and Breakdown Voltage
11. Discussion
12. Midterm Examination
13. Wide-Gap Semiconductors
14. AlGaIn/GaN HFET
15. Discussion
16. Term Examination

Contents <http://cms.db.tokushima-u.ac.jp/cgi-bin/toURL?EID=216786>

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Note This lecture will be given in English.