

Optical transitions in Eu^{3+} ions in GaN:Eu grown by molecular beam epitaxy

Andreev T., Liem N.Q., Hori Y., Tanaka M., Oda O., Dang D.L.S.,
Daudin B.

CEA/CNRS/UJF Research Group Nanophysique et Semiconducteurs, DRFMC/SP2M/PSC CEA-Grenoble, 17 rue des Martyrs, 38054 Grenoble Cedex 9, France; Institute of Materials Science (IMS), Vietnamese Academy of Science and Technology, 18 Hoang Quoc Viet, Cau Giay, Hanoi, Viet Nam; College of Technology, Hanoi National University, 144 Xuan Thuy, Cau Giay, Hanoi, Viet Nam; NGK Insulators, 2-24 Sudacho, Mizuhoku, Nagoya, Japan; CEA/CNRS/UJF Research Group Nanophysique et Semiconducteurs, Laboratoire Spectrométrie Physique (CNRS UMR5588), Université J. Fourier, Boîte Postale 87, 38402 Saint Martin d'Hères, France

Abstract: We report on the photoluminescence, photoluminescence excitation, and cathodoluminescence studies of Eu-doped wurtzite-phase GaN grown by plasma-assisted molecular beam epitaxy. Intra- 4f - transitions of Eu^{3+} ions starting from the D25, D15, and D05 excited states have been identified and show different thermal quenching in photoluminescence. The D05 $\rightarrow$ F27 transition at around 620 nm exhibits well-resolved Stark-split emission lines. Depth-sensitive cathodoluminescence and photoluminescence experiments have put in evidence two different sites of Eu^{3+} ions, one near to the sample surface and the other deeper in the volume, characterized by different crystal-field splitting, thermal quenching, and dependence on optical and electron beam excitations. It is shown that Eu^{3+} ions located deeper in the volume can be selectively excited by below-band-gap excitation. © 2006 The American Physical Society.

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Correspondence Address: Andreev, T.; CEA/CNRS/UJF Research Group Nanophysique et Semiconducteurs, DRFMC/SP2M/PSC CEA-Grenoble, 17 rue des Martyrs, 38054 Grenoble Cedex 9, France; email: tandreev@aol.com

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Authors with affiliations:

1. Andreev, T., CEA/CNRS/UJF Research Group Nanophysique et Semiconducteurs, DRFMC/SP2M/PSC CEA-Grenoble, 17 rue des Martyrs, 38054 Grenoble Cedex 9, France
2. Liem, N.Q., Institute of Materials Science (IMS), Vietnamese Academy of Science and Technology, 18 Hoang Quoc Viet, Cau Giay, Hanoi, Viet Nam, College of Technology, Hanoi National University, 144 Xuan Thuy, Cau Giay, Hanoi, Viet Nam
3. Hori, Y., CEA/CNRS/UJF Research Group Nanophysique et Semiconducteurs, DRFMC/SP2M/PSC CEA-Grenoble, 17 rue des Martyrs, 38054 Grenoble Cedex 9, France, NGK Insulators, 2-24 Sudacho, Mizuhoku, Nagoya, Japan
4. Tanaka, M., NGK Insulators, 2-24 Sudacho, Mizuhoku, Nagoya, Japan
5. Oda, O., NGK Insulators, 2-24 Sudacho, Mizuhoku, Nagoya, Japan
6. Dang, D.L.S., CEA/CNRS/UJF Research Group Nanophysique et Semiconducteurs, Laboratoire Spectrométrie Physique (CNRS UMR5588), Université J. Fourier, Boîte Postale 87, 38402 Saint Martin d'Hères, France
7. Daudin, B., CEA/CNRS/UJF Research Group Nanophysique et Semiconducteurs, DRFMC/SP2M/PSC CEA-Grenoble, 17 rue des Martyrs, 38054 Grenoble Cedex 9, France

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