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Electroluminescence from $n-n$ isotype heterojunctions of graded-band-gap ZnMgO:Al and ZnO films¹ JONG-GUL YOON, SUNG WOO CHO, University of Suwon, WOO SEOK CHOI, ReCFI, Seoul National University, DAE YEOL KIM, University of Suwon, JOONHEE LEE, Seoul National University, CHANG OH KIM, Kyung Hee University, HOJOON CHANG, HEONSU JEON, Seoul National University, SUK-HO CHOI, Kyung Hee University, TAE WON NOH, ReCFI, Seoul National University — We report room temperature electroluminescence (EL) from $n-n$ isotype heterojunction composed of Al-doped graded-band-gap $\text{Zn}_{1-x}\text{Mg}_x\text{O}$ (g -ZnMgO:Al) and ZnO films fabricated on Pt/Ti/SiO₂/Si substrates. The graded-band-gap of g -ZnMgO:Al film was investigated by spectroscopic ellipsometry and found to change continuously from 3.22 to 3.56 eV. The EL emission spectra covered visible and near infrared regions under unipolar operation condition, with g -ZnMgO:Al as positive, at the operation voltages as low as 3-5 V. Impact ionization/excitation process in a narrow region of the graded layer was suggested as a possible origin of the EL. We discussed multistep excitation process mediated by defect-related deep levels and the effect of quasi-electric field in the graded-band-gap layer in conjunction with the apparent upconversion EL in the heterojunction device.

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Jong-Gul Yoon
University of Suwon

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