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Comparison of terahertz emission from N-face and In-face indium nitride thin films GRACE CHERN, Army Reseach Laboratory, ERIC READINGER, Army Reseach Laboratory, HONGEN SHEN, Army Reseach Laboratory, MICHAEL WRABACK, Army Reseach Laboratory, CHAD GALLINAT, University of California, Santa Barbara, GREGOR KOBLMUELLER, University of California, Santa Barbara, JAMES SPECK, University of California, Santa Barbara
— Narrow band gap semiconductors are attractive as emitters of terahertz radiation when optically excited with femtosecond laser pulses. We present a comparison of THz emission from N-face and In-face indium nitride (InN) thin films. The InN samples are optically pumped with a 160 fs laser pulse at 800nm. The subsequent THz radiation is detected by ultrafast electro-optic sampling using a 2mm thick ZnTe crystal. The measured In-face InN films have a Hall mobility of 838 cm^2/Vs and 2098 cm^2/Vs, and the measured N-face InN samples have a Hall mobility of 645 cm^2/Vs and 1460 cm^2/Vs. For both polarities, we show an increase in THz power from InN with higher mobilities. However, THz radiation from the In-face InN sample with a Hall mobility of 2098 cm^2/Vs is lower in power than from the N-face InN film with a lower Hall mobility of 1460 cm^2/Vs. We attribute the lower THz power from In-face InN samples to lower crystalline quality of the In-face material, as determined by x-ray, TEM and photoluminescence measurements. The ratio of the defect density and the PL intensity between the In-face and N-face materials is approximately 3 and 10, respectively.

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