

Ultrafast Carrier dynamics in an InGaN thin film

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Abstract

We perform femtosecond degenerate pump-probe experiments on an InGaN thin film of 800 nm in thickness. The observed temperature-, pump-photon-energy-, and pump-intensity-dependent variations of ultrafast carrier dynamics manifest the variation of the space-averaged density of state with energy level in this sample. The carrier dynamics is controlled by the shift of effective band gap and hence the behavior of band filling, which are determined by the combined effect of band-gap renormalization and phonon effect (band-gap shrinkage with increasing temperature). Two-photon absorption and free-carrier absorption can be observed when the corresponding density of state is low and hence the band-filling effect is weak. The variation of the space-averaged density of state with energy level can be due to the existence of indium-composition-fluctuation nanostructures, which is caused by the spinodal decomposition process, in the sample.

Keyword : InGaN
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