Study of resonant energy transfer between GaN/AlGaN quantum wells and polyfluorene

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We seek evidence for Förster Resonance Energy Transfer (FRET) between a 200 nm-thick nitride film, containing 33 pairs of shallow GaN/AlGaN quantum wells (QW's), grown on a n+ GaN/sapphire template, and a 13 nm-thick polyfluorene layer, spinned directly on top. Two types of samples, with and without polymer, are used for characterization in time-resolved and time-integrated photoluminescence (PL) experiments, at temperatures as low as 5K up to 300K. Our results show a systematic reduction, in the samples with polymer, of both the GaN QW PL intensities and decay times, which can be pursued up to room temperature. The effect could possibly be attributed to a FRET energy transfer process from the "donor" GaN QW to the "acceptor" polymer, provided that the drop of GaN QW PL intensity is met by an equal increase in the blue polymer emission. In our case, this condition is satisfied to less than 20%, clearly suggesting that the presence of the polymer layer on the surface mainly activates a, different than FRET, non-radiative carrier recombination mechanism, which induces the large reduction in QW PL intensities and lifetimes. Ongoing experiments aim at observing such resonant energy transfer effects in GaN samples where the polyfluorene molecules are chemically bound to the GaN surface.

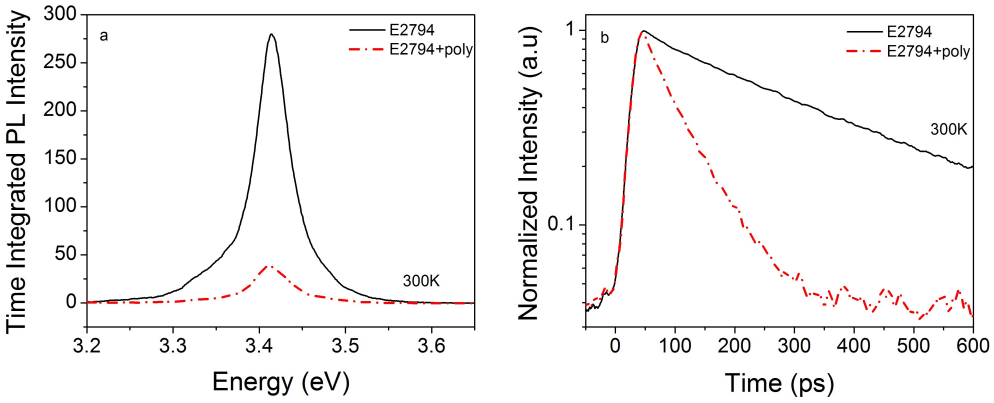

Figure 1: a) Time integrated PL and b) Time resolved PL of GaN/AlGaN QWs, with and without polymer

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