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Modifying Photoluminescence Emission from Thin Polymer Films through Local Deformation Zones[1] PO-JUI CHEN, XUAN LONG HO, JONATHON DAVID WHITE, Yuan Ze University, Taiwan — Controlling light extraction is important for applications ranging from LEDs to the weakly emissive thin films used for trace chemical detection. The commercial importance of GaN photodiodes, has resulted in the majority of work being concentrated on increasing light extraction efficiency (η) as GaN's high refractive index results in up to 96% of light being trapped and reabsorbed. Various methods, such as embedding photonic crystals and surface texturing, have been proposed and employed to improve η. Our focus is not on optimizing this quantity but rather on understanding the effect of surface modification on the angular, spatial and spectral characteristics of the emitted radiation. We do this by simulating the effect of a one-dimensional perturbation of thickness on the outputted radiation of a weakly absorbing fluorescent polymer film. While such a perturbation increases the η by a factor of two over a wide range of parameters, the film's other emission properties are quite sensitive to the surface structure. For instance, adjusting the spatial period, allows the spectral peak of the emission to be tuned over a 10nm range and the output to be localized in specific regions of the film. Adjusting the edge angle, allows one to fine tune the direction of radiation escaping the film. Finally, we will discuss tradeoff between structural parameters involved in optimizing light emission for specific detector geometries.

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