Theoretical modelling of the frequency-dependent phase shift betweenemission and excitation in ZnO nanorod photoluminescence spectra

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Hydrothermally growth, zinc oxide (ZnO) nanocrystals are known for their intersting scintillation andphotocatalytic properties. In our previous paper we presented an optical setup for measuring spectrallyresolved photoluminescence (PL) mean decay time using conventional UV LED with sinusoidalexcitation and a phase shift method with about 10 ns time resolution [1], recently upgraded to 1 ns.Photoluminescence decay is the process by which the excited state of a material, induced by theabsorption of photons, returns to the ground state, emitting light in the process. This process can bemeasured in time domain, with the decay rate indicating how quickly the material returns to its groundstate after excitation, or equivalently in frequency domain, with the difference between the phase of thelight wave at the moment of excitation and the phase of the light wave at the moment of emission. Herewe report on the theoretical modelling of the frequency-dependent phase shift between emission andexcitation in photoluminescence spectra of ZnO nanorods.

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