Stochastic simulation of transient excitonic fluxes in semiconductors for evaluation of the dislocation density from the time resolved photoluminescence intensity

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Excitonic fluxes are extracted from the transport and recombination of exci- tons governed by a 3D transient drift-diffusion-recombination equation with mixed Dirichlet and Robin boundary conditions on the plane surface and the cylindrical boundaries of the dislocations. In this presentation a stochastic simulation algorithm which solves this problem by tracking exciton trajec- tories is reported. The drift of the excitions is affected by the piezoelectric fields around the dislocations. The parameters of the piezoelectric field, the exciton's diffusion length and its mean life time are taken from experiments. The main finding in the present work concerns the relation between the pho- toluminescence intensity and the dislocation density. It is shown that from a transient photoluminescence curve it is possible to extract the dislocation density with high resolution.