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Numerical simulation of a low- and a high-electric-field photocurrent decay in aSi:H

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Abstract: We report a numerical simulation of the photocurrent decay (PCD), from the steady state, in two different structure configurations based on the a-Si:H. The standard DOS of the a-Si:H is used. The high-electric-field PCD is considered in a structure configuration based on a metal/a-Si:H junction. Poisson's and the two continuity equations are numerically solved in a one-dimensional space to calculate the current density. Two different boundary conditions of the a-Si:H film are considered. The low electric field PCD, which may occurs in a coplanar configuration, is calculated from the solution of a system of two non linear coupled rate equations which govern the free carriers concentrations and the different charges on the localized states in the gap. The calculated PCD versus time curves, for the two configurations, show a shoulder around 1?s which separate two main regions. We can see that the initial current decay is dominated by the electron emission from the conduction-band tail and the recombination via the dangling bonds states. The second current decay is mainly due to the electrons emission from the dangling bonds. We show also that the PCD curve tends towards the PCD of the coplanar configuration when the electric field decreases

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