

Title: Bias-dependent photocurrent collection in p-i-n a-Si : H/SiC : H heterojunction

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Abstract: A series of large area single layers and glass/ZnO:AVp(SixC1-x:H)/i(Si:H)/n(SixC1-x:H)/Al (0 < x < 1) heterojunction cells were produced by plasma-enhanced chemical vapour deposition (PE-CVD) at low temperature. Junction properties, carrier transport and photogeneration are investigated from dark and illuminated current-voltage (J-V) and capacitance-voltage (C-V) characteristics. For the heterojunction cells atypical J-V characteristics under different illumination conditions are observed leading to poor fill factors. High series resistances around 106 Q are also measured. These experimental results were used as a basis for the numerical simulation of the energy band diagram, and the electrical field distribution of the structures. Further comparison with the sensor performance gave satisfactory agreement. Results show that the conduction band offset is the most limiting parameter for the optimal collection of the photogenerated carriers. As the optical gap increases and the conductivity of the doped layers decreases, the transport mechanism changes from a drift to a diffusion-limited process. (C) 2002 Elsevier Science B.V. All rights reserved.

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