Title: DEMUX devices based on a-SiC:H

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Abstract: In this paper we present results about the functioning of a multilayered a-SiC:H heterostructure as a device for wavelength-division demultiplexing of optical signals.
The device is composed of two stacked p-i-n photodiodes, both optimized for the selective collection of photogenerated carriers. Band gap engineering was used to adjust the photogeneration and recombination rates profiles of the intrinsic absorber regions of each photodiode to short and long wavelength absorption and carrier collection in the visible spectrum. The photocurrent signal using different input optical channels was analyzed at reverse and forward bias and under steady state illumination. This photocurrent is used as an input for a demux algorithm based on the voltage controlled sensitivity of the device.
The device functioning is explained with results obtained by numerical simulation of the device, which permit an insight to the internal electric configuration of the double heterojunction.These results address the explanation of the device functioning in the frequency domain to a wavelength tunable photocapacitance due to the accumulation of space charge localized at the internal junction. The existence of a direct relation between the experimentally observed capacitive effects of the double diode and the quality of the semiconductor materials used to form the internal junction is highlighted. (C) 2012 Elsevier B.V. All rights reserved.

Author Keywords: Amorphous silicon; Numerical simulation; Wavelength division multiplexing (WDM); Light-semiconductor interaction

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