**Title:** Multilayer Architectures Based on a-SiC:H Material: Tunable Wavelength Filters in Optical Processing Devices

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**Abstract:** The characteristics of tunable wavelength filters based on a-SiC:H multilayered stacked pin cells are studied both theoretically and experimentally. The optical transducers were produced by PECVD and tested for a proper fine tuning of the cyan and yellow fluorescent proteins emission. The active device consists of a p-i'(a-SiC:H)-n/p-i(a-Si:H)-n heterostructures sandwiched between two transparent contacts. Experimental data on spectral response analysis, current-voltage characteristics and color and transmission rate discrimination are reported. Cyan and yellow fluorescent input channels were transmitted together, each one with a specific transmission rate and different intensities. The multiplexed optical signal was analyzed by reading out, under positive and negative applied voltages, the generated photocurrents. Results show that the optimized optical transducer has the capability of combining the transient fluorescent signals onto a single output signal without losing any specificity (color and intensity). It acts as a voltage controlled optical filter: when the applied voltages are chosen appropriately the transducer can select separately the cyan and yellow channel emissions (wavelength and frequency) and also to quantify their relative intensities. A theoretical analysis supported by a numerical simulation is presented.

**Author Keywords:** Multispectral Structures; Optical Transducer; Fluorescence Resonance Energy Transfer Detection; Electrical Model

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