

## Characterization of light detectors for applications in color for grain separators

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### Abstract

This project aims to put together a spectral response measurement system to get the answer silicon spectral light sensors provided by Dykrom Company. The sensors would be cut and characterized to find out what is the smallest size that maintains a performance acceptable.

*Key words: Spectral response, silicon light sensors, optical instrumentation*

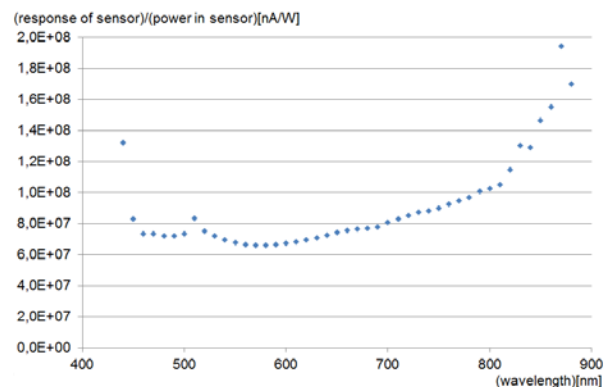
### Introduction

The color of objects can be used as parameters for its identification and classification. That is particularly useful in the agricultural industry. This process is used for classifying minerals or any other object that can be sorted by color. A simple form to implement a color sorter uses silicon sensors equipped with filters to determine the coordinates in chromatic space. The sensors consist of planar pn junctions obtained on a silicon wafer by diffusion, such as a solar cell. The sensors have metallic and continuous rear contacts and front contacts in the form of a grid to allow the entry of light. On this project we have characterized and seek to reduce the size of the sensors used by Dykrom Company [1] from Ribeirão Preto.

### Results and Discussion

To achieve the project objective, we used a Fianium supercontinuum light source coupled to a monochromator. The monochromatic light was mechanically chopped and the photocurrent in the detector obtained with a Sr-832s lock-in amplifier. The power emitted at each wavelength was obtained with a flat response Laser Precision Corp Rk-510 Pyroelectric Radiometer. The monochromator was controlled by a computer using Labview. Our study was limited to the visible light range, where the sensor will operate in the future.

**Image 1.** Response curve of the sensor versus wavelength.



The sensor can be cut in smaller pieces and subject to the same characterization to determine what effects size has on performance.

### Conclusions

We designed and implemented an automated optical system for spectral characterization of silicon sensors. It was used to measure the response of a silicon sensor. The sensor also been characterized for different cut sizes thereof.

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<sup>1</sup> DYKROM INDÚSTRIA OPTOELETRÔNICA. Access at 4/4/2014. <http://www.dykrom.com.br/>.

<sup>2</sup> Physics of Semiconductor Devices, S. M. Sze e K. K. Ng, 3a edição, John Wiley, Hoboken, 2007.

<sup>3</sup>A. D. Dass, E. Natarajan e L. Ponnusamy, 2012 International Conference on Emerging Trends in Electrical Engineering and Energy Management (ICETEEEM).

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