OPTICAL AND PHOTOTHERMAL CHARACTERIZATION IN N-TYPE AND P-TYPE POROUS SILICON

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Samples of porous silicon (PS) were prepared by electrochemical anodic etching with several etching times. It was used n-type, phosphorous doped, (100)-oriented crystalline silicon wafer (CS) (thickness: 500±15 \textmu m) of 1-5 \textohm cm resistivity and p-type, boron doped, (111)-oriented crystalline silicon wafer (CS) (thickness: 430±10 \textmu m) of 120-230 \textohm cm resistivity. In all cases was used a constant current density of 40 mA/cm\textsuperscript{2} and a HF(40\%) solution. The porous layers were prepared with etching times of 5, 10, 15, 20 and 30 minutes.

The measurements of the optical absorption spectrum were performed using Photoacoustic Spectroscopy (PAS) technique at room temperature (250 to 1000 nm). Infrared phothermal radiometry (IR-PTR) technique was used in order to obtain the photothermal response in the PS samples as a function of the etching time. In addition, luminescence and diffuse reflectance spectra were recorded.

Our results show that the photothermal response depends of the etching time, finding the highest photothermal capacity for the PS samples elaborated with 20 minutes of etching time in the electrochemical etching process, which is consistent with their corresponding optical absorption spectra. Furthermore, we show that the etching time is a parameter that determines the intensity of optical absorption of the samples.

Luminescence analysis spectra of the PS samples, using excitation energies in the region of 3.1-3.7 eV, show significant intensity corresponding to the fall between the absorption bands of the porous layer and an intense emission peak in the UV and visible band corresponding to the red-orange color characteristic of that observed with the naked eye in these samples. In the UV region, PS samples exhibit a negligible reflectance, making no contribution of this nature in luminescence.

**Keywords:** Porous Silicon, Electrochemical Etching, Photothermal Infrared Radiometry

**References:**


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