ELECTRO-OPTICAL CHARACTERISTICS OF SHALLOW SILICON JUNCTIONS FABRICATED THROUGH MASKED ION IMPLANTATION.† ANDREI P. SILARD, Polytechnic Institute, Bucharest, Romania.

ABSTRACT

The work presents the main electro-optical characteristics of very shallow silicon n^+-p and p^+-n junctions fabricated through masked ion implantation of phosphorus ($^{31}P^+$) and boron ($^{11}B^+$), respectively. The dependence of electro-optical characteristics on technological parameters (implant energy E and dose Q , oxide thickness X_{ox} , impurity redistributions, etc.) are outlined in detail.

The implant step was performed through a thermally-grown silicon dioxide (SiO_2) mask of variable thickness ($X_{ox} = 100-1200 \text{ \AA}$) at energies ranging from $E=10 \text{ keV}$ to 50 keV and with a dose level $Q = 5 \times 10^{14} - 2 \times 10^{15} \text{ cm}^{-2}$. As a rule, after the implant step the oxide layer was etched down. In several samples, the SiO_2 layer was preserved in the finished devices.

The characterization of fabricated junctions was performed using a Karl Zeiss quartz prism monochromator coupled to a Tektronix 31/4661 data acquisition system. The main peculiar results could be summarized as follows: (a) all fabricated devices possess a relatively large bandwidth (up to 580 nm) of the relative spectral response; (b) for oxide thickness $X_{ox} R_p$ (projected range), the low energy implant yields devices with good blue response; (c) for X_{ox} equal or larger than R_p a pronounced shift of the peak responsivity wavelength toward the visible spectrum of the light occurs; (d) a distinctive feature of devices consists in the high peak values of the short-circuit current density under AM1 insolation (in excess of 33 mA/cm^2); (e) the preservation of SiO_2 layer in the finished devices improves their electro-optical characteristics.

†Paper presented in symposium but not published.