Effects of Thickness and Chemical Quality of SiO_2 Barrier on $POCl_3$ Diffusion During the Formation of Emitter

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Abstract

The distribution of phosphorus dopants in the emitter formed by POCl3 diffusion show an important ‘kink’ resulting from the existence of electrically inactive phosphorus. Further, this ‘kink’ participates to form a zone called ‘dead layer’ and reduces considerably the minority carrier collection in surface. In order to minimize the effects of this layer, a new technique was used. It can be summarized in an addition of a pre-oxidation step before the phosphorus diffusion.

In this paper, we conducted a numerical simulation of phosphorus diffusion by adding a pre-oxidation step, and by varying the chemical quality of silicon oxide SiO2 (wet or dry). The thickness measurement of SiO2 layer formed was accomplished by varying several parameters as: pressure, temperature, and diffusion time. Our results show that it is possible to reduce the kink by a dry SiO2 layer and thickness of 80 nm.

Keywords

- Silicon solar cells;
- phosphorus diffusion;
- thermal oxidation;
- numerical simulation;
- diffusion profile