

**SIMULTANEOUS DIFFUSION OF BORON AND PHOSPHOROUS
INTO SILICON FOR THE FABRICATION OF SOLAR CELLS**

BY

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ABSTRACT

It has been well established that P^+-N-N^+ (or N^+-P-P^+) structure based back surface field (BSF) silicon solar cells have a definite advantage over the conventional P^+-N (or N^+-P) cells. In this work a systematic study has been carried out to fabricate P^+-N-N^+ BSF silicon solar cells by a low cost process. A new process of fabrication of P^+-N-N^+ structure silicon solar cells by simultaneous diffusion of boron and phosphorous into silicon through a thermally grown silicon dioxide layer into silicon has been developed. The simultaneous diffusion of boron and phosphorous into silicon through silicon dioxide has been found highly suitable for fabrication of P^+-N-N^+ BSF silicon solar cells. This is evidenced by the fact that the cells fabricated using float-zoned silicon of 100 ohm cm. base resistivity have exhibited open circuit voltages about 0.6 volt at 28°C under AM1 illumination of 100 mW/cm^2 intensity. In addition to this, the process reduces the number of processing steps of P^+-N-N^+ or N^+-P-P^+ cell fabricated and is therefore very attractive with the view of large scale production. Also it is established from experiments that this process is highly reproducible to yield good quality solar cell.

Investigations have been made to explore the usefulness of phosphorous and boron diffusion through silicon dioxide layer into silicon. For this purpose, the three most important

parameters of diffusion, viz., surface concentration, doping profile nature and junction depth have been measured accurately for various diffusion conditions. A new method of determining diffusion length in N^+-P-P^+ (or P^+-N-N^+) structure based cells has also been developed.

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