SILICON DOPING PERFORMED BY PECVD METHOD FOR SOLAR CELL APPLICATIONS

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In this work boron-doped silicate glass (BSG) source deposited by plasma enhanced chemical vapor deposition (PECVD) method is investigated. Usually BSG layers are deposited by thermal annealing process with proper oxygen and BBr3 gases. Motivation of this PECVD based research is realizing simultaneous phosphorus and boron doping of silicon by using BSG and phosphorus-doped silicate glass (PSG) as solid state diffusion sources. In this article we focused the research to optimizing BSG layers for silicon solar cell applications. By adjusting the annealing temperature and gas flow ratio of SiH4, B2H6, H2 and CO2 gases, we obtain sheet resistance in a range from 60 to 250 Ω/□ after thermal drive in and BSG removing processes. Majority carrier lifetime as high as 190µs (for Rs=206 Ω/□) are demonstrated by using PECVD deposited BSG layers. Boron concentrations are analyzed by measuring SIMS profile, the highest value is 2.4 × 10²¹ cm⁻³. The B2H6 gas flow ratio and annealing time are the key parameter to define doping concentration. XPS measurements were also carried out to analyze chemical properties of wafer at each step of our processes.