Single Side doped a-Si (poly-Si) Deposition and Surface Oxidation for Passivated Contact Technology

Thomas Grosse¹, Hans-Peter Sperlich¹, Daniel Decker¹, Marcel König¹
¹ Meyer Burger (Germany) AG, An der Baumschule 6 – 8, 09337 Hohenstein-Ernstthal, Germany

Abstract

As PERC (Passivated Emitter and Rear Cell) technology became more and more standard in the PV industry, solar community is already looking for further improvements to increase cell and module power and lower the levelized cost of electricity (LCOE). Since PERT and PERT technologies suffers particularly from recombination losses at the front end back side contacts the passivated contact technology become more and more of interest to reach efficiencies above 23.0% using most of standard PERC equipment. As possible upgrade of existing p-PERC (and/or n-PERT) production lines doped poly-Si (a-Si) deposited using Meyer Burger production equipment has the best preconditions for low production costs as the deposition is single sided which makes additional masking or wet chemistry steps unnecessary.

Realizing passivated contact technology depends strongly on the possibility to grow a high quality, reliable surface oxide in a stable and high volume capable process. The most cost effective way to implement passivated contact technology is to do all necessary process steps in just one additional production equipment. On the Meyer Burger PECVD tool very thin surface oxide formation with doped a-Si deposition was combined. Therefore a N2O-plasma oxidation was applied to grow a thin SiO layer directly before amorphous silicon deposition.

For poly-Si optimization different doping gas ratios were investigated towards their final passivation quality and doping concentration. After additional SiN passivation, implied Voc can be further improved by around +10mV. Fig. 1a and b) show the lifetime and implied Voc measurement of different doping gas ratios for crystallized n+ poly-Si with or without SiN capping layer. The surface oxide was performed using MAiA plasma oxidation.

![Figure 1](image_url)

Figure 1: Comparison of different doping gas ratio of PECVD a-Si on n-type Si with plasma oxidation after high temperature crystallization, a) without or b) with SiN, capping before firing

Latest results on optimization of deposition conditions and the resulting cell performance will be presented.