

INVESTIGATION OF THE ALUMINUM PASTE COMPOSITION AND LASER CONTACT OPENING GEOMETRY FOR PERC SOLAR CELLS

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Passivated emitter and rear contact (PERC) solar cells are increasing its market share in production technology with over 20GW expansions and production line upgrades.

Laser ablation of the rear passivation stack films is used standardly to make laser contact opening (LCO). LCO became a common process to allow the screen-printed aluminum reaction with silicon locally and form local back surface field (L-BSF) during the firing process. This laser process is very critical to achieve higher efficiency as the surface morphology plays a key role in the increasing or decreasing the reaction between aluminum and silicon. In this work, calculated Voc from the PL image after metallization using various LCO geometries and different silicon content (0, low, mid, high) in the aluminum pastes. Table 1 shows the LCO geometry using in this experiment and Figure 1 depicts the Voc results. As a result, the Voc is improved with increasing the silicon contents for dotted dash line pattern. This does not only improve the Voc but also restricts the void formation between the Al-Si interface. Adding silicon will decrease the void creation and improve the mechanical reliability of the solar cells.

Table 1. LCO geometry

		Continuous Line			Dash Line		Dot Line
Opening size	μm	30	40	30×700	40×700	40	
Line pitch	μm	1000	1000	1000	1000	1000	
Dash pitch	μm	-	-	300	300	-	
Dot pitch	μm	-	-	-	-	40	
Calculated opening area	%	2.9	3.8	2.0	2.7	1.7	
Fixed ablated area	%	2.6	3.7	1.8	2.6	1.3	

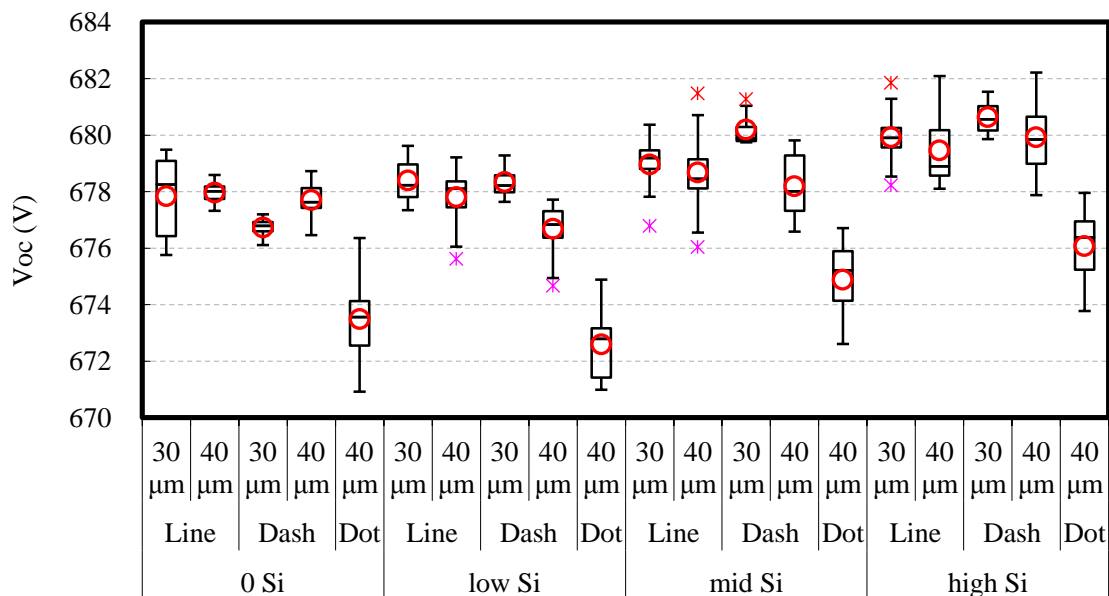


Figure 1: Voc results calculated from the PL image