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## UNDERSTANDING OF ANNEALING EFFECTS ON PASSIVATION QUALITY OF POLY-SI/SIOX/C-SI PASSIVATED CONTACTS

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In this study, the effects of annealing on passivation quality of poly-Si/SiO<sub>x</sub>/c-Si contact (poly-Si contact) were investigated. For experiments, intrinsic poly-Si layers were deposited by LPCVD on a tunnel oxide surface, followed by n+ poly-Si doping via diffusion in a POCl<sub>3</sub> tube furnace. For lightly doped poly-Si contacts, higher temperatures and longer times increased *i*V<sub>OC</sub> achieving maximum value of 734 mV, because of a poly-Si grain growth effect, as shown in Fig. 1. However, for highly doped poly-Si contacts, *i*V<sub>OC</sub> decreased from 731 mV to 696 mV as annealing time increased, which was caused by Auger recombination. The effects of poly-Si grain growth and Auger recombination on passivation quality of poly-Si contacts were analyzed in detail. Finally, a TOPCon solar cell using a poly-Si contact on the back and boron diffused emitter on the front was fabricated. As a result, a solar cell with 21.1% efficiency, 665 mV V<sub>OC</sub>, 40.6 mA/cm<sup>2</sup> J<sub>SC</sub>, and 78.3% fill factor was fabricated as shown in Fig. 2.

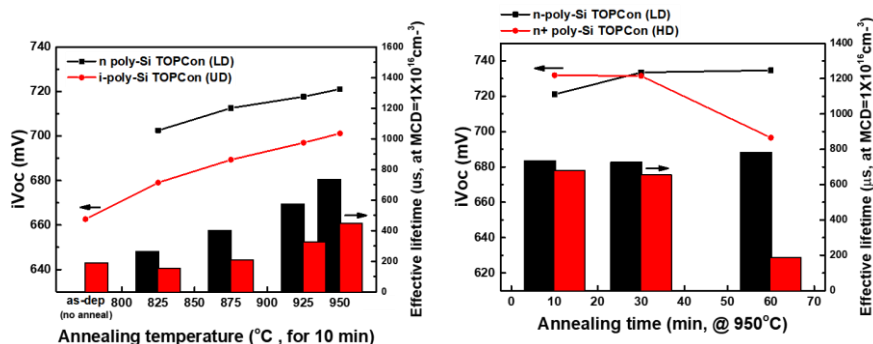
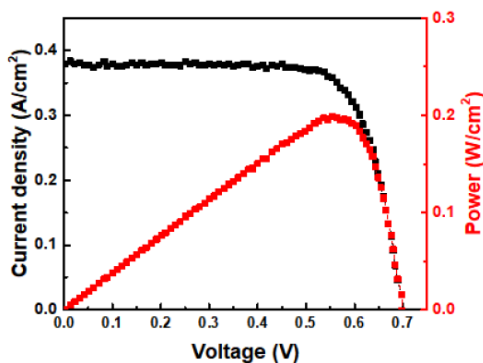


Figure 1: Implied open circuit voltage of poly-Si contacts as a function of annealing temperature for 10 min and annealing time at 950 °C



Size	V <sub>OC</sub> [mV]	J <sub>SC</sub> [mA/cm <sup>2</sup> ]	FF [%]	Eff. [%]
2x2 cm <sup>2</sup>	665	40.6	78.3	21.1

Figure 2: I-V curve result of solar cell fabricated using poly-Si contacts structure