PC1D Simulation을 통한 결정질 실리콘 태양전지의 국부적 후면 전극 최적화 설계

*오 성근, 임 충현, **조 영현

An optimal design for the local back contact pattern of crystalline silicon solar cells by using PC1D simulation

*Sungkeun Oh, Chung-Hyun Lim, **Younghyun Cho

In the crystalline silicon solar cells, the full area aluminum_back surface field(BSF) is routinely achieved through the screen-printing of aluminum paste and rapid firing. It is widely used in the industrial solar cell because of the simple and cost-effective process to suppress the overall recombination at the back surface. However, it still has limitations such as the relatively higher recombination rate and the low-to-moderate reflectance. In addition, it is difficult to apply it to thinner substrate due to wafer bowing. In the recent years, the dielectric back-passivated cell with local back contacts has been developed and implemented to overcome its disadvantages. Although it is successful to gain a lower value of surface recombination velocity(SRV), the series resistance(R_{series}) becomes even more important than the conventional solar cell. That is, it is a trade off relationship between the SRV and the R_{series} as a function of the contact size, the contact spacing and the geometry of the opening. Therefore it is essential to find the best compromise between them for the high efficiency solar cell. We have investigated the optimal design for the local back contact by using PC1D simulation.

Key words : PC1D, Local back contact(국부적 후면 전극), Back surface field(후면 전계), Surface recombination velocity(표면 재결합 속도), Mono-crystalline Si solar cell(단결정 실리콘 태양전지)

E-mail : *osk0314@hyosung.com, **ycho@hyosung.com

태양전지용 실리콘 제조를 위한 슬래그 이용 야금학적 정련연구

*김 대석, 이 상욱, 박 동호, **류 태우, 문 병문, 민 동준

Metallurgical refining study for production of solar grade (SoG) silicon by synthetic slag

*Daesuk Kim, Sangwook Lee, Dongho Park, **TaeU Yu, ByungMoon Moon, DongJoon Min

In this study, metallurgical grade (MG) silicon with 99% purity produced by arc furnace process was systematically investigated for slag refining. The most problematic impurities to remove from MG silicon are boron (B) and phosphorus (P). To remove B and P from MG-silicon, we used synthetic slag in the molten state. MG-silicon with synthetic slag of CaO, SiO_2, and CaF_2 was melted using by high-frequency induction furnace with electrical output of 50kW. Specimens prepared by various refining process conditions(holding time, mixture ratio) were inspected by combined analysis of ICP-MS and XRF. With this approach, B has been reduced to <5ppm, P to <1ppm and other impurities to 0.1~0.2% except for Calcium. Calcium has been increased from 17ppm to 1500ppm. Problem of calcium contamination will be resolved by additional refining processes.

Key words : Refining(정련), Synthetic slag(슬래그), Metallurgical grade silicon(금속급 실리콘), High-frequency induction furnace(고주파 유도로)

E-mail : *manguth@kitech.re.kr, **ytu@kitech.re.kr