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Autore	Cho Eun-Chel
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Sommario/riassunto

This book is composed of 6 papers. The first paper reports a novel technique for the selective emitter formation by controlling the surface morphology of Si wafers. Selective emitter (SE) technology has attracted renewed attention in the Si solar cell industry to achieve an improved conversion efficiency of passivated-emitter rear-contact (PERC) cells. In the second paper, the temperature dependence of the parameters was compared through the PERC of the industrial-scale solar cells. As a result of their analysis, PERC cells showed different temperature dependence for the fill factor loss as temperatures rose. The third paper reports the effects of carrier selective front contact layer and defect state of hydrogenated amorphous silicon passivation layer/n-type crystalline silicon interface. The results demonstrated the effects of band offset determined by band bending at the interface of the passivation layer and carrier selective front contact layer. In addition, the nc-SiOx: H CSFC layer not only reduces parasitic absorption loss but also has a tunneling effect and field-effect passivation. The fourth paper reports excimer laser annealing of hydrogenated amorphous silicon film for TOPCon solar cell application. This paper analyzes the crystallization of a-Si:H via excimer laser annealing (ELA) and compared this process with conventional thermal annealing. The fifth paper reports the contact mechanism between Ag–Al and Si and the change in contact resistance (Rc) by varying the firing profile. Rc was measured by varying the belt speed and peak temperature of the fast-firing furnace.

The sixth paper reports a silicon tandem heterojunction solar cell based on a ZnO/Cu2O subcell and a c-Si bottom subcell using electro-optical numerical modeling. The buffer layer affinity and mobility together with a low conduction band offset for the heterojunction are discussed, as well as spectral properties of the device model.