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Next – generation interdigitated back-contacted silicon heterojunction solar cells and modules by design and process innovations

NextBase - Deliverable report

D3.2- Optimized thermal processes for bulk lifetime improvement

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Publishable summary

The impact of high-temperature thermal processes on n-type Cz wafers from 2 different ingots with different resistivity profiles (WN16C417**3200** and WN16C417**4200**) from Norwegian Crystal was investigated. $POCl_3$ diffusion at 845°C was performed on wafers from the "top" and "end" regions of these ingots and the changes in bulk quality and bulk resistivity were monitored. It was found that even before the $POCl_3$ diffusion, the quality of the wafers were high enough to exceed the lifetime/resistivity ratio target of 2 ms/Ω.cm. In addition, the wafers of ingot WN16C417**3200** were found to be higher in lifetime and resistivity compared to WN16C417**4200**.

After $POCl_3$ diffusion, the minority carrier lifetimes measured on untextured wafers of both ingots were about twice as high compared to those measured on wafers that were untreated. Moreover, the bulk resistivity values of the wafers increased after the high-temperature treatment due to thermal donor killing. The strongest effect was seen for the "top" wafers and in particular for wafers of ingot WN16C417**3200**.

On textured wafers, the measured lifetimes were lower, and the 2 ms/Ω.cm line was only exceeded for the gettered wafers of WN16C417**4200**, while the lifetime target of 3 ms on textured wafers was exceeded for wafers of ingot WN16C417**3200** and the "top" wafers of WN16C417**4200**. By determining the implied V_{OC} and implied FF, and calculating the implied efficiency, it can be estimated that gettering can lead to an improvement of ~0.5% in the final cell efficiency.