

Effects of surface texturing on germanium solar cell performance

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Germanium has a lower band gap compared to silicon, which enables it to absorb photons from the low energy part of the solar spectrum. In the present study, we examined the effect of surface preparation and texturing Ge wafer on the solar cell performance.

We used several types of Ga-doped p-type Ge wafers with (100), (110), and (111) orientations. In order to investigate the effect of texturing on Ge surface, two types of etching/texturing have been demonstrated: H₂O₂:H₂O and HF:H₂O₂:H₂O. Next, the wafers were phosphorus implanted. The dopants were activated by RTA. Al was deposited for the backside contact and Ag for the front contact. Ge(111) wafers revealed an improved cell efficiency when they were texturized in HF:H₂O₂:H₂O solution, while (110) wafers showed an improvement with the H₂O₂:H₂O texturization. As a result, the highest efficiency of 1.9% was observed with HF:H₂O₂:H₂O-texturized Ge(111) wafer, while non-texturized Ge(111) exhibited 1.3% of efficiency.