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Surface Passivation of Multicrystalline Silicon Solar Cell via Combination of LiBr/Porous Silicon and Grain Boundaies Grooving

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Abstract : In this work, we investigate the effect of combination between the porous silicon (PS) layer passivized with Lithium Bromide (LiBr) and grooving of grain boundaries (GB) in multi crystalline silicon. The grain boundaries were grooved in order to reduce the area of these highly recombining regions. Using optimized conditions, grooved GB's enable deep phosphorus diffusion and deep metallic contacts. We have evaluated the effects of LiBr on the surface properties of porous silicon on the performance of silicon solar cells. The results show a significant improvement of the internal quantum efficiency, which is strongly related to the photo-generated current. We have also shown a reduction of the surface recombination velocity and an improvement of the diffusion length after the LiBr process. As a result, the I–V characteristics under the dark and AM1.5 illumination were improved. It was also observed a reduction of the GB recombination velocity, which was deduced from light-beam-induced-current (LBIC) measurements. Such grooving in multi crystalline silicon enables passivization of GB-related defects. These results are discussed and compared to solar cells based on untreated multi crystalline silicon wafers.

Keywords : Multicrystalline silicon, LiBr, porous silicon, passivation
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