The mechanical strengths of the silicon substrates with different surface morphologies in silicon solar cells

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Abstract : In this paper, the influence of various etching technologies on the mechanical strengths of the silicon substrates was investigated by 4-point bending tests. The yield for solar cell industry is mainly related to the fracture of silicon wafers in manufacturing process. The mechanical strengths of the silicon substrates were influenced by the pyramidal base shape as well as the size and the rounded surface of pyramids.

In order to characterize and optimize relevant texturing process in terms of mechanical stability and fabrication yield, the mechanical properties of the textured silicon substrates were investigated considering the size and the morphology of random pyramids. Several types of silicon substrates were studied: the planar, the textured surface with large and small pyramids, the textured surface with rounded pyramids, the textured surface with non-square base shape. The surface morphology and the cross section of the as-textured and fractured silicon substrates have been investigated by means of scanning electron microscopy.

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