

Area1: Crystalline and Thin Film Silicon PV

Recent Progress and Challenges of Cast Silicon for Photovoltaic Industry

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With the breakthrough of the crystal growth technology for multi-crystalline silicon (mc-Si) in 2011 based on the uniform small-grain nucleation, i.e., the so-called high-performance (HP) mc-Si, the mc-Si solar cell efficiency in industry has been increased dramatically. The market share of HP mc-Si was near 70%. Nowadays, HP mc-Si solar cells from a normal screen-printing aluminum back surface field (Al-BSF) production line could easily reach 18.8%. With the passivated emitter and rear cell (PERC) structure using PECVD alumina passivation, an average efficiency of over 19.8% could be obtained. With the advanced texturing, 20.4% efficiency in production has also been reported; the champion is over 21.6%. Recently, a new efficiency record of 21.9% has also been reported based on n-type HP mc-Si using the TopCon cell structure. Besides the success, the HP mc-Si technology is facing significant challenges recently. The diamond-wire sliced mono-crystalline wafers and the direct wafers have emerged with sufficiently low cost and good quality scrambling to share more PV market. On the other hand, the adoption of diamond-wire slicing to HP mc-Si is still slow due to poor texturing quality in the cell production line. The cast mono, or called mono-like, silicon is an alternative solution. In this presentation, the recent progress of both HP mc-Si and cast mono Si will be review, and their future challenges will be discussed.