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Grain Growth Behavior of Directionally Grown Multicrystalline Silicon

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Grain size plays an important role in determining the performance of multicrystalline Silicon (mc-Si) solar cells. During growth, some grains grow larger while others die out, however it is unclear on which grains are dominant and what factors affect the grain size.

In this study, the evolution of the grains with respect to growth was investigated on mc-Si (r=53mm, H=80mm) grown by the directional growth method. In this ingot the leftover feedstock (few µm grain size) became the seed of the growth. The ingot was first cut vertically in the centre to observe the change in grain size (vertically) with respect to height. As can be seen from the electron backscatter diffraction (EBSD) images in Fig.1., the average grain size increases with growth. The grain size ranges from a few 100 µm at the bottom to over 5mm at the top.

One half of the ingot was then cut into horizontal wafers from bottom to top with an interval of 1.3mm to observe the grain size (horizontally) and orientation distributions with respect to height of ingot. Grain boundary distribution was also studied using EBSD and dislocation density distribution was studied by etch pit counting. These results will be discussed at the conference.

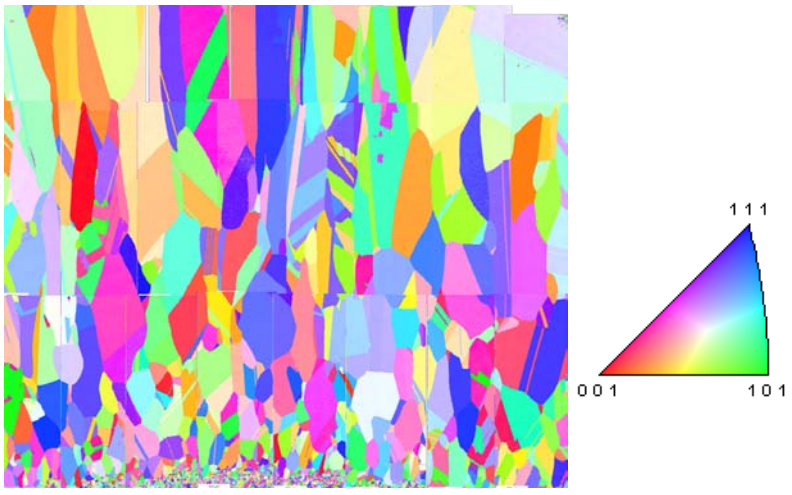

Fig. 1. Electron Back-Scatter Diffraction showing orientations of grains grown near feedstock (in the bottom region). (The image is approximately 1cm x 1cm)

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