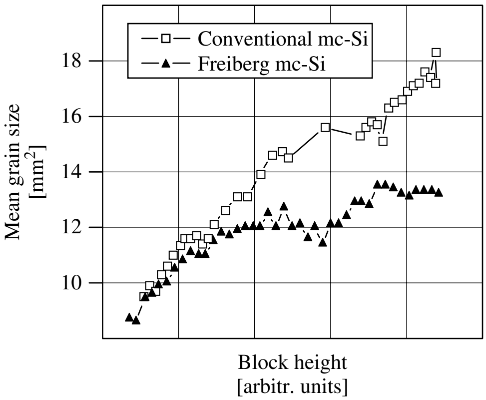

Figure 6.9 Mean grain size as a function of the block height for conventional Bridgman-type multicrystalline silicon (mc-Si) and the faster crystallised block-cast material from the Freiberg production facility of Deutsche Solar GmbH. Reduced crystallisation times lead to slightly lower grain sizes of the Freiberg mc-Si

Because also in modern high-throughput production processes a nearly perfectly planar solidification front is kept throughout the crystallisation process, grain boundaries show only weak electrical activities and therefore are generally considered as less important for solar cell efficiencies.

Crystal dislocations, however, turned out to be the most efficiency-relevant defects in multicrystalline silicon for solar cells. The dislocation density that is experimentally accessible by counting micrometer-small etch pits after appropriate chemical etching steps nearly shows a perfect correlation to the wafer lifetime and diffusion length (Figure 6.10) that are closely linked to solar cell performance. Dislocations are induced and multiplied

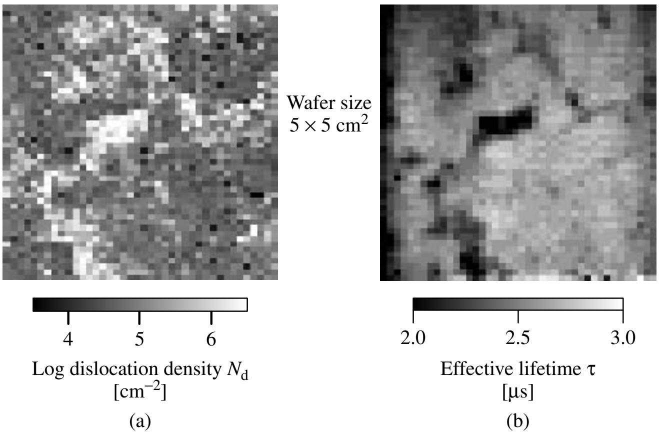

Figure 6.10 Topographies of the dislocation density N_d (a) and the effective lifetime τ_{eff} (b) of a typical multicrystalline silicon wafer showing the excellent correlation of both parameters. The effective lifetime measurements were conducted out without any surface passivation and thus are limited to less than approximately 3 μs by surface recombination processes