solidifies and the solidification direction of the silicon itself, as shown in Figure 6.32. By this, a very high production rate of one wafer per second is realisable. For this process numerical simulations were performed describing the crystallisation of the silicon ribbon in further detail. This simulation is realised by a phase-field approach [95]. In Figure 6.33 two nucleation states of the silicon on the substrate are compared by their temperature field in two-dimensional simulations. In the first case a supercooled region in front of the tip of the growing crystal leads to a more dendritic growth mode of the crystal, because the liquid–solid interface is morphologically non-stable. In the second crystallisation mode,

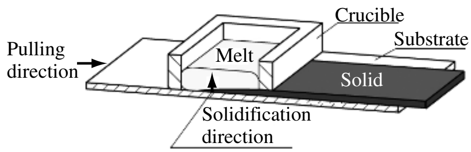

Figure 6.32 Scheme of the RGS process. The latent heat is removed through the substrate. By this, solidification is propagated vertical to the substrate and is de-coupled from substrates' pulling direction

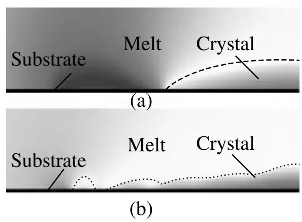

Figure 6.33 Simulated temperature profile on the RGS substrate. Light grey scales indicate high temperatures. The liquid–solid interface is marked with the dotted line. Unstable crystal growth into a supercooled melt at the tip of the ribbon. Nucleation of new grains limits the supercooling and leads to a stable columnar grain growth

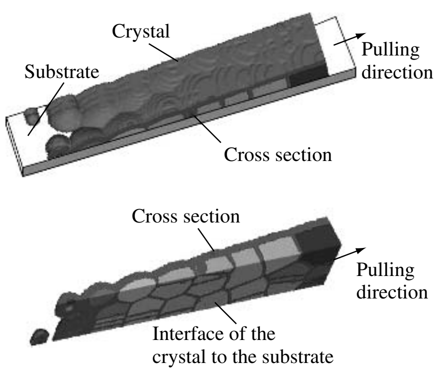

Figure 6.34 Simulation results of the growth of silicon grains on the RGS substrate during solidification. Different grains are marked by different grey scales. The liquid–solid interface is marked by a darker grey scale and envelops the grains. For a better visibility, the melt is not shown in this figure