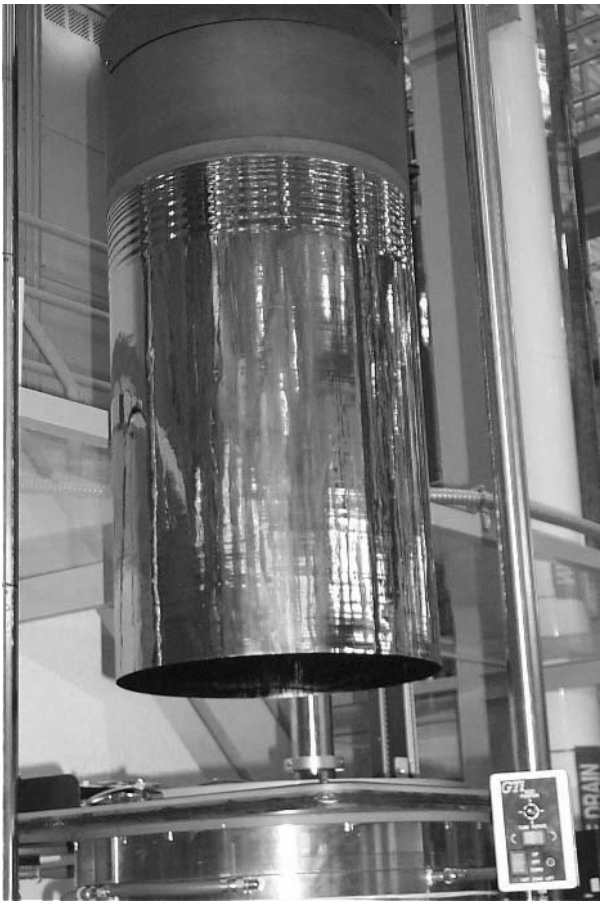

Figure 6.23 Experimental 50-cm-diameter EFG cylinder exiting from furnace

the growth process and maximises its stability to mechanical and thermal fluctuations. Depending upon the wetting qualities of the strings and their diameter, the meniscus height at the strings near the edges differs from that at the centre, and it is usually much lower at the edges [52, 53].

For comparable thicknesses, the growth velocities of STR are similar to EFG and WEB. Careful adjustment of the growth parameters can allow very thin ribbon, down to 5 μm, to be grown [54]. Generally passive after heaters are used, but some work on an active after heater has been carried out to allow low-stress, 100-μm-thick ribbon to be grown. This material was sufficiently flat to be made into solar cells. Because of the concave downward meniscus curvature at the string, any grains nucleated at the strings can propagate into the ribbon.

RGS. In this growth technique, the silicon melt reservoir and die are placed in close proximity to the top surface of a substrate, on which the ribbon/foil grows. The substrate may be graphite or ceramic (Figure 6.25) [55]. The principle is to have a large wedge-shaped crystallisation front. The die contains the melt and acts to fix the width