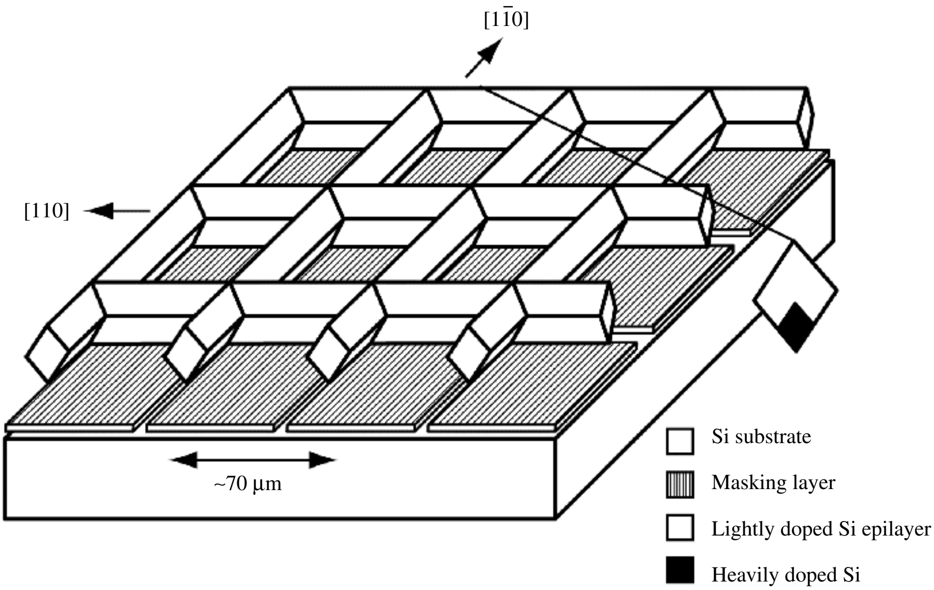

Figure 8.9 A schematic of the epilift process. Masking layer – Si_3N_4; epi layer is grown by LPE process. Typical epi thickness = 20 μm

8.2.3 Non-Si Substrates

The cost advantages of thin-film Si are likely to be realized if the support for the thin film consists of a low-cost substrate. Clearly, in this case, it is not possible to directly deposit a crystalline or mc-Si film. Use of a non-Si substrate has gained some prominence because of the recent success in depositing μc-Si on glass substrates at reasonably low temperatures. However, there are a number of challenges in making such a device. These challenges are related to both the design and the fabrication process(es) of the device. A major issue in the device design is identifying method(s) for efficient light-trapping that are compatible with a low-cost cell design. Theoretical calculations show that film thicknesses of about 10 μm are sufficient to yield photocurrent densities of 35 mA/cm^2 in fairly simple thin film device structures [19]. Other issues of device design are related to the carrier-collection approaches, such as the nature of junction(s), electrode geometry, and electronic and optical reflectors. Finally, all of these aspects must be achieved compatible with low-cost methods of cell fabrication.

A recent advance in Si-based thin-film technology has led to a new realm of thin-film μc-Si solar cells. The Kaneka group has developed a cell configuration called ***Surface** Texture and enhanced Absorption with a back Reflector* (STAR) [45, 46]. Figure 8.10 shows a sketch of the STAR cell. It consists of a glass substrate with a back-reflector on which an *n*-type μc-Si film is deposited by the plasma CVD process. Next, an *i*-type poly-Si film (typically 2 to 4 μm thick) is deposited at substrate temperature <550°C; this layer has no intentional doping, but is slightly *p*-type and has a carrier concentration