at a controlled temperature of 25°C. Defective devices are then rejected, and the rest are classified according to their output. The manufacturer establishes a number of classes attending, typically, to the cell current at a fixed voltage near the maximum power point. Modules will subsequently be built with cells of the same class, thus guaranteeing minimal mismatch losses. If, for instance, cell currents within a class must be equal within 5%, the accuracy and stability of the system must be better than that. Automatic testing systems that meet the very demanding requirements of high throughput processing are available.

7.4.2 Screen-printing Technology

Screen printing is a thick-film technology, a terminology that opposes it to the usual microelectronic procedures of evaporation of thin films. It consists in translating a layer of a material in a desired pattern to the surface of the wafer. Though it can be employed for virtually any step in solar cell manufacturing, contact formation constitutes the most demanding, frequent and conspicuous application of screen printing. Screens and pastes are the essential elements of this technology [68].

1. *Screens*: Screens are tight fabrics of synthetic or stainless steel wires stretched on an aluminum frame, as sketched in Figure 7.8. The screen is covered with a photosensitive emulsion, which is treated with photographic techniques in such a way that it is removed from the regions where printing is desired.

   For printing fine and thick layers, as is needed for the front contact of a solar cell, the wires must be very thin and closely spaced [73]. On the other hand, the opening of the reticule must be several times larger than the largest particle contained in the paste to be printed. Screens for solar cell production typically feature 200 wires per inch, wire diameter around 10 μm, mesh opening around 30 μm, corresponding to

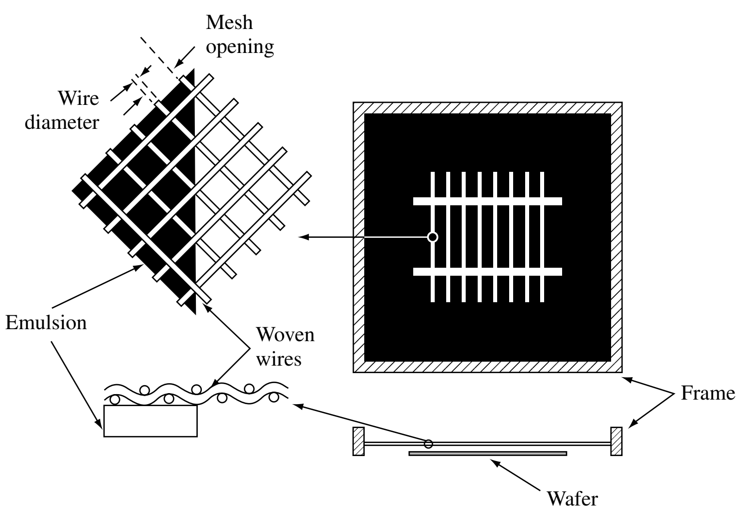

Figure 7.8 A screen for transferring the top contact pattern to a solar cell