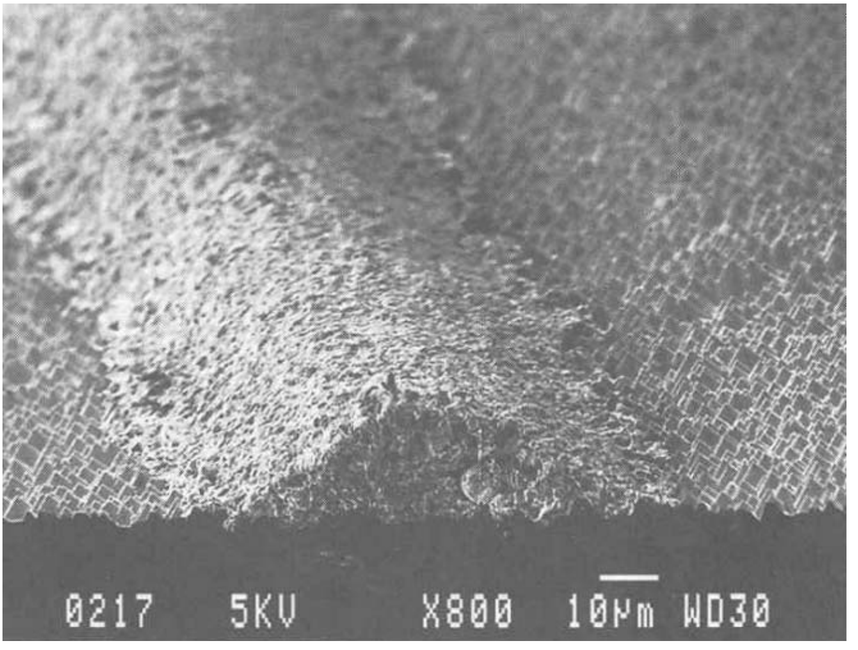

Figure 7.10 Screen-printed contact finger; texture pyramids are also visible. (Reprinted from *Solar Energy Materials and Solar Cells*, **41/42**, Nijs J, Demesmaeker E, Szulfcik J, Poortmans J, Frisson L, De Clerq K, Ghannam M, Mertens R, Van Overstraeten R, "Recent improvements in the screen-printing technology and comparison with the buried contact technology by 2D-simulation", 101–107, (1997), with permission from Elsevier Science)

pitch-to-diameter ratio of the wires, which are both limited. Besides, screens become deformed with usage and a continuous deterioration of printed patterns is observed.

Metal stencils [76] can outperform screens: they produce finer lines with better aspect ratio, endure more printing operations without degradation and need less cleaning and maintenance.

In screen printing, the wafer is subjected to considerable pressure. This can pose a problem with very thin or irregular wafers, such as those obtained by sheet growth of silicon, which can break down. Metallization alternatives have been developed, some of which are used in industries. They will be presented in Section 7.7.

7.4.3 Throughput and Yield

Because of the rapidly growing demand, photovoltaic factories are quickly expanding their production volumes so that there is a strong driving force to increase the throughput of processes and equipment. Automation is being extensively applied to the fabrication of solar cells and in-line, continuous processing tends to displace batch steps: in the process outlined above, only chemical etches, tube diffusion and edge isolation are batch steps. Automation and large-scale production lead to reduced costs [77].

Most processes described above have been borrowed from the electronic industry: diffusion, plasma etching, and so on are standard in microelectronics, while screen printing