

High Speed Dispensing Solutions for Solar Cell Metallization Applications

Metallization is one of the key components for the manufacturing of high efficiency solar cells. Screen printing has been the dominating technology for this process, which is becoming the bottle neck for next generation solar cells. There is a trend to make thinner cells, since the price of the base material (poly silicon) is increasing dramatically. Screen printing, as a contact process, tends to break cells, thus to reduce the throughput as well as the yield. Another drawback of screen printing is the limitation for narrower lines, which is the target for the PV manufactures. Therefore, there is a great need to develop a non-contact technology to produce the 60-80 microns lines, but done so with a high aspect ratio. In order to solve this problem while keeping high throughput, nScript Inc. has developed high speed dispensing technology for the solar cell metallization process. This is a non-contact, through nozzle dispensing technology. The nozzle (tip) has been optimized to a conical shape which reduces the pressure needed to extrude highly viscous conductive pastes, thus increases the flow rate at the same pressure level (as compared to standard tubing tip) and makes the high speed printing possible. This technology can handle materials up to several million centipoises in viscosity. A number of PV materials have been dispensed (evaluated) at several hundred mm/second. To further enhance the speed, parallel dispensing has also been demonstrated. A novel pumping technology, which employs a special needle valve mechanism to control flow on and off coupling with the high speed ensures material is accurately deposited and placed (x, y, z). The needle valve technology enables pico-liter level control in the dispense process. Micro resolution x, y and z stages are integrated to the system, which enables the precise of placement. In the paper, high speed dispensed PV lines and busbars will be presented. The preliminary testing results showed the cell efficiency is noticeably increased vs. that of those printed by screen printing provided everything else is the same.