



Application Note: Secondary Electrons

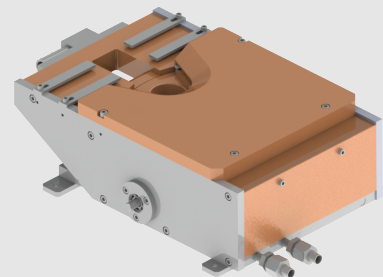
Delicate substrates, such as photoresist or PMMA films, can easily be damaged by stray electrons produced by an electron beam source. The influence of these secondary electrons can be minimized by a proper selection of system design, source characteristics, and process parameters. This Application Note will provide an overview of these design choices, helping to minimize substrate damage from secondary electrons.

System Design

The single greatest influence on substrate damage by secondary electrons is caused by placing the substrate too close to the evaporant source. For delicate substrates, Telemark typically recommends a source-to-substrate distance greater than 500 mm.

Source Characteristics

Telemark electron beam sources are designed to minimize production of secondary electrons. Telemark's multiple pole piece magnetic design ensures that the electron beam achieves a 90° angle of incidence on the evaporant surface, minimizing backscattered secondary electrons. Furthermore, Telemark's standard extended source design with a permanent magnet mounted at the rear of the source provides magnetic containment of secondary electrons, which helps to keep secondary electrons away from the substrate.



Process Considerations

Quite a few process parameters can influence the generation of secondary electrons. Secondary electron production increases with beam energy, so often reducing the source operating voltage from 10 kV to 8 kV can reduce secondary electrons. Lower deposition rates can also reduce secondary electron production. It is also important for many materials to well condition the evaporant before beginning deposition. An extensive pre-melt for granular material as well as an appropriate ramp and soak before deposition will minimize secondary electron production.