Socket Applications

As semiconductor device manufacturers struggle to keep up with the demands of Moore's Law, Integrated Circuits (ICs or "chips") are becoming increasingly sensitive to Electrostatic Discharge (ESD). One of the main reasons for this increased sensitivity is the ever decreasing feature width on the surface of the chip. As feature width goes below 100 nanometers, the IC become much more sensitive to static discharge. The solution is to prevent exposure of the IC to a static discharge by designing static dissipation performance into any plastic part in the vicinity of the chip.

Test sockets are used to determine if a device meets design specifications by temporarily mounting the chip on a circuit board and taking it for a "test drive". In a typical high throughput environment, a test socket will see a large number of device insertions and removals. The friction of insertion and removal can build up a charge on the socket. If this built up charge is discharged near an IC it could cause either a catastrophic failure - which will result in lower yields, or it could cause latent defects - which will impact product reliability. Thus the socket must be electrostatically dissipative.

FIBRIL nanotubes can be used at low loadings in all the polymers typically used to make sockets to make static dissipative test sockets. The nanotube filled polymers provide the necessary static decay, while maintaining a relatively high surface resistivity. In contrast, other static decay materials become too conductive and compromise the device's signal integrity with "cross-talk" between contacts. For a more complete discussion of the effect of FIBRIL nanotubes on the rate of static decay and surface conductivity, please go to "Designing for ESD"

In addition to special electrical characteristics, the low loading of FIBRIL nanotubes also preserves more of the base resin's toughness compared to traditional conductive additives. For test sockets that are machined, a brittle compound makes machining much more difficult, lowering yields or decreasing production rates.

For injection molded sockets, the low loading of nanotubes minimizes increases in the viscosity of the polymer melt. Lower viscosity allows easier filling of the tool, which is important since sockets frequently have very thin walls. Finally, because nanotubes are randomly oriented within the resin, they minimize differential mold shrinkage and give balanced coefficient of thermal expansion (CTE) – both of these are important for tight tolerance applications like sockets.