Micro-coaxial Cable Stripping with Electronic Flame-off Process

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Abstract

The interconnect density of unshielded wires (UW) in wire-bonded circuits is limited by crosstalk and external interference. In order to surpass these limitations, micro-coaxial cables (MCCs) can be employed as interconnects in microelectronic devices. However, tensile strength limitations of MCCs limit the viability of traditional wire stripping techniques, complicating the integration of MCCs. In this work, an electronic flame-off (EFO) stripping process was investigated as a means to strip back the shield from delicate MCCs with outer diameters of 25 to 50 µm. EFO is currently used in commercial wire bonding tools as a means of forming a ball on the tip of a wire via rapid heating from a plasma discharge prior to ultrasonic bonding. This technique was used to strip back a gold shield on a polymer insulated copper wire and core-shield shorting post-EFO stripping was analyzed. High-magnification high-speed videos were taken to observe the recession of shield metal during EFO discharge. SEM analysis also confirmed that dielectric is present between the core and shield in polyimide MCCs, but absent in polyurethane MCCs after EFO stripping. The stripped end of a polyimide MCC was milled with a focused-ion-beam (FIB) and SEM showed that dielectric surrounded the core throughout its cross section. These results indicate that the decomposition temperature of the polymer insulation is a key determining factor in successful EFO stripping. In addition, a model of the EFO stripping process was developed in order to further investigate this process and determine its viability in MCCs of varying chemistries.