

### CAF, SIR and ECM/EMR Testing:

As spacing and part sizes on PCB's decrease, the need to verify Conductive Anodic Filament (CAF), Surface Insulation Resistance (SIR) and Electrochemical Migration Resistance (ECM/EMR) have become increasingly necessary. These tests use high temperature/humidity environments in order to understand a product's reliability by accelerating any failures that might happen. Electrical attributes are evaluated during or after accelerated environmental exposures to further ascertain the product's performance under these severe conditions.

**Conductive Anodic Filament (CAF)** formation is a well-studied phenomenon that is driven by chemical, humidity, voltage, and mechanical means. It is characterized by a sudden loss of insulation resistance that happens internally in the PCB. CAF dendrites can form between adjacent plated through holes (PTH), or between a plated through hole and a line on the PCB. Plating chemistry, material consistency, damage from multiple soldering steps, and excessive voltages (beyond designed voltages) accelerate the onset of CAF. The mechanism of CAF is an electro-chemical transport of ions across an electrical potential between anode and cathode.

**Surface Insulation Resistance (SIR)** testing is a methodology used to characterize the PCB manufacturing and electronics assembly process residues and their impact on reliability. It is usually performed on industry standard test board coupons containing patterns, typically interlocking comb test patterns designed for process testing purposes. The patterns are exposed to a high humidity environment which mobilizes any surface contaminants and reduces the insulation resistance of the test pattern.

**Electrochemical Migration Resistance (ECM/EMR)** is the transport of surface materials caused by the gradual movement of the ions in a conductor due to the momentum transfer between conducting electrons and diffusing metal atoms. The effect is important in applications where high direct current densities are used, such as in microelectronics and related structures. As the structure size in electronics decreases, the practical significance of this effect increases. Electrochemical Migration decreases the reliability electronics by causing high resistance shorts of the circuitry. In the worst case it leads to the eventual loss of one or more connections and intermittent failure of the entire circuit. Since the reliability of interconnects is not only of great interest in the field of space travel and for military purposes but also with civilian applications such as anti-lock braking system of cars and telecommunications.

Microtek Laboratories has over 22-years of experience with Environmental Simulation and Accelerated Life testing including CAF, SIR and ECM/EMR testing and can help you in understanding the reliability and performance of your product. Microtek provides the fastest possible turnaround and highest level of technical support for testing your products. Utilizing the latest technology, Microtek Laboratories possesses the technical expertise to meet even your most demanding testing requirements and can perform testing to military and commercial applications such as the BELLCORE GR-78-CORE , specific customer standards and IPC test methods.