

SEARCHING FOR PURE TIN ON ELECTRONIC COMPONENTS: TIN WHISKER PREVENTION

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Tin whiskers are a known phenomena which occurs in electronic circuitry, mechanical fasteners, and sensor assemblies causing untold problems from failed circuits to tin plasmas¹. Tin whiskers arise from using pure tin as solder or coatings on electrical contacts. These whiskers have been discovered on both active and passive circuit components, with and without so-called boundary layers and even with mitigation coatings. The best remedy to date is insuring that there is no pure tin within the circuitry. This usually means using a tin/lead solder with a minimum composition of at least 3 weight percent of lead present. Even specifying “no pure tin” on procurement agreements does not insure that “no pure tin” will be delivered. This is especially aggravated with recent requirements for ROHS compliance. It is apparent that the burden of proof is incumbent on the user of the materials to insure that there is no pure tin on the parts and in the materials being used for critical electronic applications.

X-ray fluorescence is a rapid and direct method for elemental analysis. It is a recommended method for determining whether the parts in question are pure tin or not. However, the actual answer is quite dependent upon the excitation area where the instrument is actually looking. Recent measurements in our laboratory have identified parts which originally had been tinned by the vendor. Since this was known to the user of the electrical parts, the offending pure tin was removed and the part re-soldered with a tin/lead alloy. The cleanup was to be verified by doing spot MXRF analyses to confirm the proper tin/lead alloy was deposited onto the leads of the part. While spot analyses did indeed confirm that 60/40 tin/lead solder was used, we also identified regions of pure tin close to the insulating base of the part which were difficult to reach with the soldering iron. This pure tin identification was only achieved using elemental MXRF mapping. One can easily be fooled by single point spectra providing false security that all pure tin has been eliminated. The implication of this is whether the tin/lead coatings are done in house or by a commercial vendor, ultimately one needs to double check to insure all the tin is alloyed.

1. <http://nepp.nasa.gov/WHISKER/>