

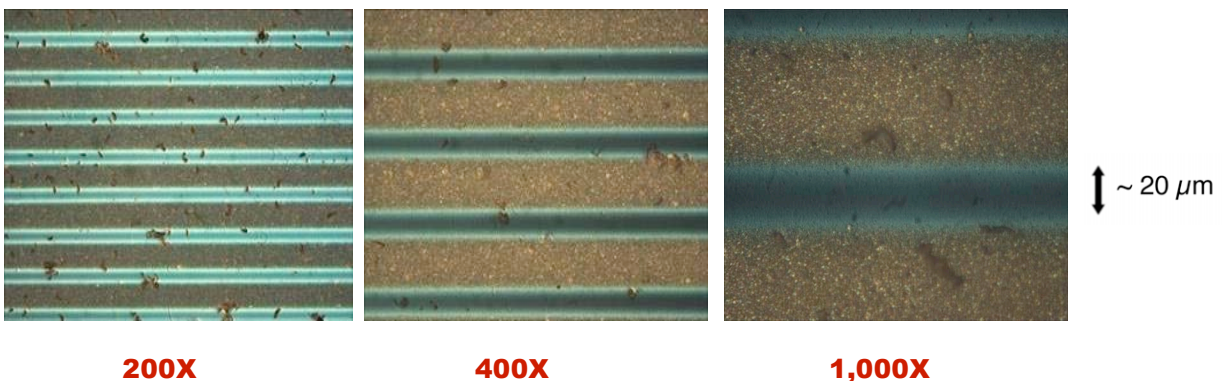
Auburn University Lauds POSS[®] Short-Stop As Impressive Way To Suppress Tin Whiskers In Lead Free Solders

Hattiesburg, MS: The Space Research Institute's Surface Science Laboratory at Auburn University has released their exciting test results of Hybrid Plastics' *Short-Stop*, a novel sprayable, cost effective conformal coating for the suppression of tin whiskers in lead-free solder and electronic circuits.

Henry W. Brandhorst, Jr., Director of the Institute, lauded the material saying, "The results have been impressive and conclusive! *Short-Stop* absolutely prevented the growth of tin whiskers in electronic applications. It's also important that it does this at a highly affordable, very low cost because it is applied by spraying and only a very thin layer is required. Thus the overall cost and ease of application seems to be much lower than other types of conformal coatings. The other great thing about *Short-Stop* is that it can be applied either at the OEM stage of production or as an after-market application. My thanks to Hybrid Plastics for developing such an innovative, successful product that eliminates a problem that has vexed the electronics industry for a long time."

The POSS[®] *Short-Stop* is optically transparent, colorless and available in either aerosol or bulk for airless sprayers. The new materials were developed under a Small Business Innovation Research (SBIR) contract between Hybrid Plastics Inc., subcontractor Michigan State University and collaborator Vista Engineering. The effort was focused on solving a well-recognized problem of lead-free solders - the growth of conductive tin-whiskers. Depending on the spacing of interconnects and environmental stress, conductive tin whiskers may grow long enough to create short circuits that cause electronic systems to malfunction or become permanently damaged. The solution was enabled through incorporation of mercapto functionalized Polyhedral Oligomeric Silsesquioxane (POSS[®]) nanocages into polyimide coatings. The mercapto groups bind to the metal surface, protonate through the metal oxide layer and bind to the underlying tin atoms thereby mitigating compressive stress and nucleation of whisker growth. In the event that tin whiskers do grow, a tough high modulus polyimide surface coating is also utilized to force collapse of the whisker and thereby physically isolate whiskers against short-circuiting or detachment.

Test Specimens – No Whiskers Observed



Tin Whisker Suppression with Short-Stop (20 μm)
Courtesy - Space Research Institute, Surface Science Laboratory, Auburn University

Hybrid has developed a platform technology called POSS[®] (Polyhedral Oligomeric Silsesquioxane). It is a revolutionary new Nanotechnology based on silicon-derived building blocks that provide nanometer-scale control to dramatically improve the thermal and mechanical properties of traditional polymers while offering easy incorporation into existing manufacturing protocols. They release no VOCs and, thereby, produce no odor or air pollution. They are biocompatible, recyclable, non-flammable, and competitively priced with traditional polymer feedstocks. POSS[®] nanoscopic chemical technology provides unique opportunities to create revolutionary material combinations through a melding of the desirable properties of ceramics and polymers at the 1 nm length scale. These new combinations enable the circumvention of classic material performance trade-offs by exploiting the synergy and properties that only occur between materials at the nanoscale.

Last year the company received a Frost and Sullivan *Best Practices Award*. Frost & Sullivan stated "Hybrid Plastics' customer service is unparalleled in the high performance fillers market." Hybrid Plastics was one of five finalists in Small Times Magazine's *2002 Best of Small Tech Award*. In December 2005, a *Presidential Determination* deemed POSS[®] Nanotechnology to be in the strategic national interest of the United States. The company has received two *R&D 100 Awards*, most recently in 2009 for the use of its compounds as flow aids.

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