Center for Advanced Vehicle Electronics (CAVE3)

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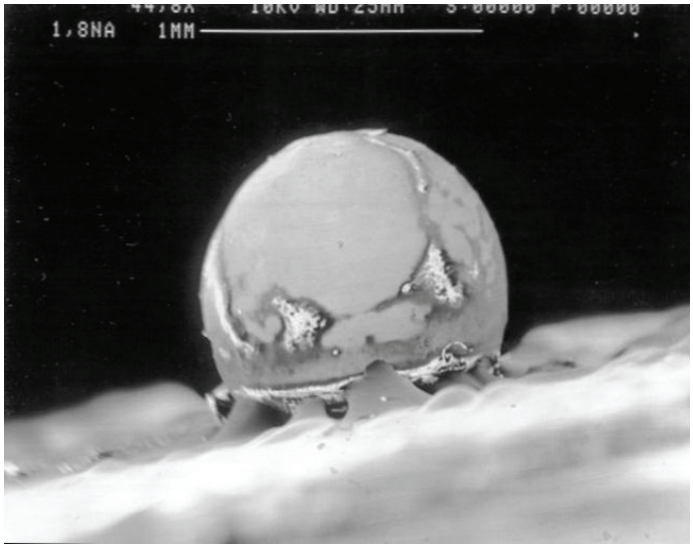
New Experimental Techniques to Study Solder Materials and Processes

Work in CAVE3 has led to the development of several new innovative experimental techniques to study solder alloys. A unique scanning electron microscope has been developed that allows for real-time and in-situ studies of the melting, wetting, and spreading of solder alloys and pastes. The system allows for microscopic observation of the advancing molten solder with simultaneous analysis of alloy-substrate chemical reactions during wetting. It is highly unusual to undertake studies of liquids in expensive and high-performance vacuum systems due to potentially high vapor pressures and flux outgassing.



A molten solder ball.

In addition to the ability to study molten solders, CAVE3 is the first organization to develop a scanning electron microscope to measure strains in materials during repetitive temperature cycling processes such as those common in under-the-hood electronics. A third unique apparatus developed by CAVE3 is a custom-made surface analysis system that enables in-situ studies of surface segregation during melting and wetting processes.

> **Economic Impact:** Results from the use of this novel facility have especially benefited CAVE3 industrial sponsors who use solder materials and technology. The ability to study fundamental properties of electronic materials in-situ has reduced the development costs associated with new electronic platforms. In absence of these new experimental methods, significant system level testing would have to be undertaken for validation of the material performance in electronic manufacturing process. The reduced material development time is expected to result in faster time to market.

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