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Measuring the True Wetting Time of Solders

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As the electronics industry prepares to meet the requirements of the European Community's RoHS directive on lead in electrical and electronic equipment an issue about which concern is frequently expressed is the apparently inferior wetting performance of lead-free solders. The general observation is that lead-free solders are slower to wet and then do not spread far beyond the area of direct contact. There is also much discussion of the relative merits of various lead-free solders in terms of their wetting time, which is usually reported as the time from first contact of the sample with molten solder to the time at which the net force on the sample is zero. However, the performance of some lead-free solders in this wetting balance test has been found not to correlate with their practical performance in soldering processes; an alloy with what appears to be inferior performance in the wetting balance test performs better in actual production soldering than an alloy that had a better result in the wetting balance test. In the work reported in this paper the data that emerges from a wetting balance test was studied in detail. It was found that the result of the wetting balance test could be correlated with the performance of the alloy in production soldering only if the force vs time plot is analysed in terms of five distinct stages with the performance of the alloy as a solder correlating best with time taken for the force to increase from its maximum negative value to zero and then to the maximum wetting force.