Chemical Influences on the Reliability of Complex Assemblies

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ABSTRACT

Reliability is one of the key performance drivers of the microelectronics industry today, from conventional Electronics Assembly to high-end semiconductor packaging applications. Miniaturization trends (small pitches and thicknesses, low standoff heights), coupled with a dramatic increase in assembly complexities (3D architectures, Systems in a Package, large form factors, hybrid components and assembly materials) increase the risks of in-field failures. Even more concerning to the end-users of electronic components is the difficulty to predict the in-field reliability of complex assemblies using accelerated tests. No holistic model is applicable to the specific usage conditions of one-of-a kind assemblies subjected to particular environmental conditions (Temperature cycles, Humidity, Voltage Bias, Vibrations, Chocks, Atmosphere, ….), and involving peculiar interactions between assembly components (Fluxes, Underfills, Conformal coatings, Die-Edge coats, Adhesives,…). Therefore, it is of paramount importance for the end user to develop an in–depth understanding of the failure mechanisms at play, as well as an awareness of the potential contribution of each assembly material to these phenomena. Kester, as a tier-1 supplier of a wide range of electronic assembly materials, will leverage his fundamental knowledge of flux systems and fluxing mechanisms to bring a chemist's perspective over reliability failures. After describing the chemical contributions to various failure modes (Electro Chemical Migration, Shorts, Corrosion, Deposits….), we will demonstrate how these mechanisms are influenced by the end-usage conditions. This will show how sound formulation principles, paired with a thorough understanding of the application environment, will allow the chemists to design robust and reliable chemical systems able to sustain harsh operating conditions. From this perspective, we will highlight the benefits of a thorough technical partnership between the flux formulator and the end-user to mitigate the risks associated with their specific end-use conditions.