Course subject:

Reliability and industrialization of a new SnZnBiInP lead-free solder series

Course leader: Ma Jusheng—Tsinghua University

Speech Description/Objective:

According to global implementation of RoHS regulations, leaded solder has been changed to high melting point lead free solder such as SnAgCu, SnAg or SnZn series etc. And for SnZn lead free solder, it always has issues like high reflow temperature at 210℃/240℃, long process time, high cost, and poor reliability which restrict its application.

In terms of lead-free solder technology roadmap, the second generation of low melting point solder has been developed. SnZn solder with eutectic point of 198°C is regarded as one of the promising solutions, but the issues of low oxidation resistance and poor reliability should be solved. The target is to develop low melting point solder with both high oxidation resistance and moisture resistance, which is adapted to meet global warming, environmental adjustment, energy conservation reduction strategies.

In this course, a low cost, low melting point SnZnBiInP series lead free solder has been developed successfully. Performance controlled factors for oxidation resistance have been studied, which includes material compositions, manufacturing and application processes to enhance solderability, processability. Wettability, mechanical strength and thermal fatigue characteristics of new solder are higher than those of leaded eutectic solder, also it has high reliability compared with SnAgCu lead-free solder. The solder has low oxygen content with only 10nm thickness of surface oxidation on solder powder. Compared with SnAgCu lead-free solder, the SMT process temperature is about 30℃ lower, also the whole process time is short with low exhaust gas. It is confirmed by solder manufacturers that SnZn lead-free solder has similar characteristics to SnAgCu lead-free solder with superior parameters.

As conclusion, a feasibility assessment method for lead free solder mass production applications is set up and presented:

1. Safety of manufacturing process with non-toxic and harmless properties;
2. Stability of solder alloy properties after solder manufacturing process;
3. Process applicability, stability and economy;
4. Solder products reliability, with standards such as high temperature Storage, Temperature cycle, thermal shock etc.;
5. Long-term characteristic qualification such as product failure rate etc.

Production-study-research-Application alliance is a fast, cost-effective approach for new solder Application promotion.

Who Should Attend:

Researchers and students who is working or interesting in packaging materials, especially in solder or lead free solers etc.

Introduction of Speaker：

Ma Jusheng is Professor of Tsinghua University, IEEE Fellow and The University of Tokyo Fellow.

She graduated from Dept. of Mechanical Manufacturing Engineering at Tsinghua University in 1959 and joined Tsinghua University as a teacher in the same year, served as an associate Professor in 1984, Professor in 1990, and doctoral supervisor in 1992.

From 1985 to 1989, he was dispatched by government scheme to Japan Sumitomo Special Metals Ltd. as a visiting chief researcher, and co-published patents on silver-brittle resistant sealing alloys and researches on oxidation defects of color TV anode caps， the technology has applied on Xianyang Rainbow TV Factory for mass production of domestical anode caps.

At 1990‘s, she led the "Eighth Five Year Plan" interdisciplinary major project of National Natural Science Foundation: Applied Basic Research on High Density Microelectronic Packaging, and co-chaired key projects of National Natural Science Foundation：Research on New Materials and Interconnection Technologies for High Density Packaging.

From 1997 to 2002, she was appointed as Chief Professor of Electronic Materials Research Office, Materials Science Research Institute, Tsinghua University and Director of Takashi Hashimoto Laboratory. She retired from Tsinghua University from 2002.

She was General Secretary of ICEPT1998, Organizing Committee chair of ICEPT2001, and ICEPT2009, and she was awarded Special Achievement Award for Electronic Packaging Technology by CIE-EMPT in 2009. Later, she was member of ICEPT Advisory Committee.

In 2007, she was recognized as IEEE Fellow due to outstanding research achievements in electronic materials and packaging technology, as well as her outstanding contributions and leadership position in high-density packaging fields in mainland China.

From 2002 to 2020, she worked as a visiting researcher at the University of Tokyo. In 2011, she was recognized as a The University of Tokyo Fellow at Faculty of Engineering.

Her research fields focus on: Special functional materials, electronic materials and reliability etc.