



**Speech subject:** New interconnect material for high-reliability SiC power modules

**Speech leader:** Chuantong Chen—Associate professor, Osaka University

**Speech Description/Objective:**

Silver (Ag) sinter joining is becoming an important interconnection technology for die attach in power electronics. It exhibits superior process ability, high-temperature resistance and long-time durability to traditional connection methods such as solder joining or conductive adhesive joining. Massive works have demonstrated Ag sinter paste is capable to achieve a robust and reliable die attach on DBC substrate under a mild sintering condition (pressure-less, low temperature and atmospheric sintering). However, Ag sinter joining is also facing some huge issues, for example, high price especially for the Nano-Ag paste, excessive interfacial stress and reliability problems caused by the large mismatch of CTE (thermal expansion coefficient) between SiC, and the problem of coarsening of microstructure of sintered Ag paste during high temperature. In addition, electromigration of Ag sinter also is a big issue for the high reliability structure. In this presentation, we will summary the micron-sized Ag sinter joining in SiC power modules, and propose a new die attach material with Ag-Si composite sintering to achieve for the low material cost, Low CTE and high reliability in high temperature of SiC power modules. The bonding quality, bonding mechanism will be also introduced. The microstructure stability during high temperature, and improved structure reliability during a harsh thermal shock test will also be introduced with the thermal stress analysis by FEM simulation for a comprehensive understanding to design a high reliability structure of SiC power modules.

**Speech Outline:**

1. > Background of WBG power devices
2. > Micron-scale silver paste interconnection and performance
3. > Introduction of low CTE silver-silicon paste and high-temperature structural stability
4. > Issues of silver paste interconnection under thermal shock and the excellence of silver-silicon paste
5. > Mechanical properties and thermal stress analysis of silver-silicon paste
6. > Evaluation and analysis of electromigration of silver-silicon paste

**Who Should Attend:**

Suitable for researchers who are engaged in the development of interconnect materials in power devices, reliability research, power module structure design, mechanical properties and finite element simulation of interconnect materials, and electromigration research

**Introduction of Speaker:**

Chuantong Chen, received the Ph.D degree in mechanical engineering from Nagoya Institute of Technology, Japan, in 2015. From 2016 to 2019, he was an assistant professor at Institute Scientific and Industrial Research (SANKEN), Osaka University, Japan. He became to an associate professor in SANKEN of Osaka University from 2020. His research interest includes lead-free soldering, Ag sinter joining, Nano-joining, 3D packaging, and power electronics packaging. He has published more than 120 SCI journal papers and 90 IEEE conference papers in above fields. Prof. Chen was a recipient of some awards and honors including the IEEE EMPC Best poster award, IEEE ICEP Outstanding Technical paper Award in 2023, and the IEEE CPMT Japan Chapter Young in 2019. He also applied and obtained 21 Japanese and international patents, including 3 US patents. Prof. Chen serves as technology committee member of IEEE

ICEP and IEEE ICEPT and serves as the committee member of Kansai branch of the Japanese Electronics Packaging Society, and a committee member of international standardization for the third-generation semiconductor packaging substrate material, interconnections, heat conduction evaluation system and equipment in Japan. He is responsible for several Japanese national projects including NEDO, JST, JSPS, and a few projects with company such as MITSUBISHI HEAVY INDUSTRY, FUJI ELECTRIC, TOPPAN, DOWA and DAICEL about 500 million yen in last 5 years.