Interface Engineering for Hybrid Bonding Interconnect

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Abstract:

Hybrid bonding is a key technology for advanced packaging and 3D integration, enabling high-density interconnects through the simultaneous direct bonding of dielectric and metal. This capability is essential for supporting next-generation applications such as high-performance computing, artificial intelligence chips, and high-bandwidth memory. As bonding pitch continues to scale down to the sub-micron level, interfacial quality has become a critical factor determining interconnect reliability and electrical performance. Consequently, one of the major challenges today is how to precisely engineer these interfaces to achieve robust and reliable bonding. In this talk, I will review recent progress in hybrid bonding interface investigation, with particular emphasis on the development of novel interconnect materials, interface characterization and engineering, and the understanding of bonding mechanism. I will also discuss the application of advanced characterization techniques for real-time monitoring of interfacial evolution during processing, which plays a vital role in guiding the development of effective interface optimization strategies for hybrid bonding.

Speaker's Biography:

Renxi Jin is a Professor at the Institute of Microelectronics, Chinese Academy of Sciences (CAS). He received his Ph.D. from Northeast Normal University in 2016 and subsequently conducted postdoctoral research at Peking University and the University of Notre Dame (USA). Before joining CAS, he worked as a Senior Engineer in the R&D department of a leading global technology company. His research specializes in high-density interconnects for 3D chip stacking. To date, he has published over 50 papers in top-tier journals, including *PNAS*, *JACS*, and *ACS Nano*, and has led multiple research projects, including grants from the National Natural Science Foundation of China.