Navigating the Interconnection & Assembly Technologies Landscape

Vanessa Smet
3D Systems Packaging Research Center (PRC)
Georgia Tech, USA

This tutorial will cover the fundamentals of interconnections and assembly of electronic systems with an interdisciplinary perspective. Spanning from materials, multi-physics design of the interconnection system, manufacturing considerations, to characterization methods for process, performance and reliability assessment, the goal is to provide practical tools to guide the selection of a comprehensive solution that meets your application requirements. An essential part of navigating this technology landscape is to understand the trade-offs between the different physics at play and potential mitigation strategies. We will also share insight on recent developments, particularly pertaining to the use of nanoscale materials and their promise to advance the field.

The participants are not expected to have any background in materials, electronics system assembly or reliability to attend this tutorial. At the end of the tutorial, we expect the participants to have a better understanding of how to approach such technological choices, from design to product qualification, and how the proposed methodology is applied within the Packaging Research Center (PRC) to address technology gaps in assembly of systems in a wide range of applications.

Duration: 1.5 hours (including Q&A)

Bio of Vanessa Smet:

Dr. Vanessa Smet is an Assistant Professor of the George W. Woodruff School of Mechanical Engineering at Georgia Tech. After a two-year postdoc at Tyndall National Institute (Cork, Ireland), Vanessa joined the PRC team in late 2012 as a Research Engineer where she focused her research on advancing interconnection and assembly technologies as well as exploring novel 3D architectures for the packaging of wide-bandgap-based power electronics in electrified transportation. More specifically, her team has enabled, for the first time, reliable scaling of the conventional Cu pillar technology to below 20um pitches by exploring novel surface finish metallurgies, and extended the performance of chip-to-substrate interconnections with unique solutions, such as metastable solid-liquid interdiffusion bonds and compliant nanoporous-Cu caps for direct Cu-Cu bonding. At board level, her work has focused on qualifying and extending board-level reliability of large-size glass interposer packages exploiting various strain-relief mechanisms, and on enabling socketable BGAs with the development of a new class of solder spheres with multilayered thin-film coatings. Her research interests are highly interdisciplinary in nature, and span from the design, characterization, and fabrication of multi-functional nano-/micro-structured metals and metal-based composites to meet application-driven performance and manufacturing criteria; integrated and miniaturized cooling solutions; multi-physics modeling and design optimization; and reliability, prognostic and condition monitoring.