TECHNISCHE UNIVERSITÄT
IN DER KULTURHAUPTSTADT EUROPAS
CHEMNITZ

Institut für Physik

Physikalisches Kolloquium

Donnerstag, 04.06.2026, 15:30 Uhr

Ort: Reichenhainer Str. 90;
Zentrales Hörsaal- und Seminargebäude, Raum C10.013

Prof. Dr. Bernhard Wunderle

Technische Universität Chemnitz,
Professur Werkstoffe und Zuverlässigkeit
mikrotechnischer Systeme

Multi-Scale Thermo-Mechanics for Electronics Packaging – from Power & HPC to Cryo & Quantum

Modern smart society hinges crucially on the performance and reliability of electronics in key sectors as communication, power and energy as well as transport to name only a few. Behind electronics there are semiconductors. To integrate them into increasingly complex systems, packaging technologies are required as key enabler along with other high-performance materials, depending fundamentally on the field of application as e.g. power-electronics, micro-electronics, lighting, etc. Each of these application scenarios defines a set of thermo-mechanical loading conditions limiting the lifetime of those systems through material degradation and correspondingly involved failure mechanisms.

Over the last couple of years, electronics packaging has not only moved towards high power and high temperatures, but also down to low temperatures to enable cryo-packaging of highly complex systems as e.g. for quantum computers. In this vein, especially ion-trap-based systems have received lots of attention due to their favourable scaling capability. However, this sphere of R&D is still only vaguely defined w.r.t. materials and packaging technologies to address the huge challenges of integration, miniaturisation, scaling, thermal management and thermo-mechanical reliability. As quantum computing is truly believed to be the next big thing, there is a worldwide race to build them.

The talk provides an introduction to modern thermo-mechanical reliability methodology based on physics of failure mechanisms in experiment and simulation. It illustrates the field using results from current examples of heterogeneously integrated systems, including power electronics, HPC and sensors before moving to the challenges of cryo-packaging, thereby addressing material and technology issues for the 3D architecture of ion-trap-based quantum computers.

Alle Zuhörer sind ab 15:15 Uhr zum Kaffee vor dem Hörsaal eingeladen.