Contribution ID: **246** Contribution code: **THP37** Type: **Poster Presentation**

In-situ characterization thermal contact variations between InGa and anti-corrosion layer for beamline thermal management

Thursday 18 September 2025 16:40 (1 hour)

Liquid metals as thermal interface materials (TIMs) offer ultrahigh contact thermal conductance while their inherent compliance eliminates clamping stress-induced deformation in optical components, such as InGa bath or InGa gap cooling. However, their corrosivity toward metals (e.g., Cu, Al) necessitates protective coatings such as high-phosphorus electroless nickel (Ni-P), though minor corrosion persists during prolonged baking operation. To investigate the correlation between corrosion behavior and baking conditions (80˜150 ℃/14 days), we developed an in situ measurement system for liquid metal thermal contact conductance. The setup employs a square-waved heating excitation method to monitor transient temperature responses (peak values, PV), coupled with finite element modeling, to quantify interfacial thermal conductance degradation. This work provides critical insights into thermochemical reliability for liquid metal cooling solutions in high-heat-load synchrotron optics.

Footnotes

Funding Agency

Author: CHEN, Jie (National Synchrotron Radiation Laboratory; University of Science and Technology of China)

Co-authors: DIAO, Dezhi (Zhejiang Institute of Photoelectronics & Zhejiang Institute for Advanced Light Source); ZHOU, Qi (National Synchrotron Radiation Laboratory; University of Science and Technology of China); WEI, Shen (National Synchrotron Radiation Laboratory; University of Science and Technology of China); JIANG, Shuaikang (University of Science and Technology of China); DU, Xuewei (National Synchrotron Radiation Laboratory; University of Science and Technology of China)

Presenter: CHEN, Jie (National Synchrotron Radiation Laboratory; University of Science and Technology of China)

Session Classification: Thursday Poster Session

Track Classification: SIMULATION: Thermal