Demonstration of a compliant micro-spring array as a thermal interface material for pluggable applications

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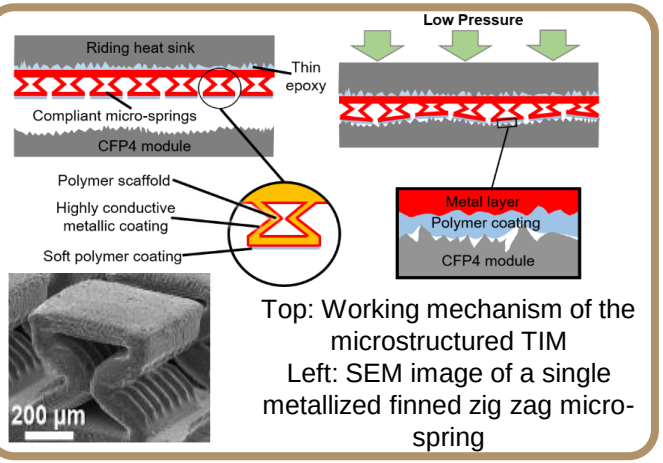
Objective

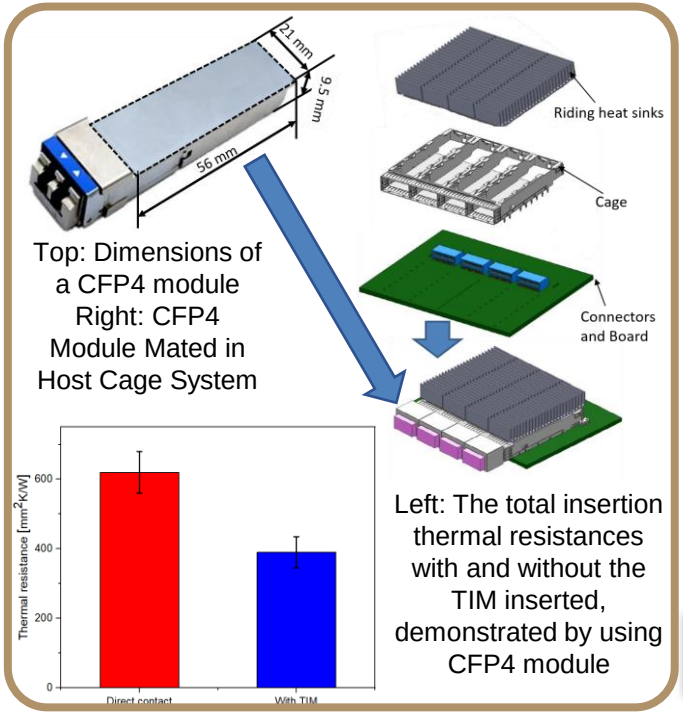
Develop novel solution for the enhancement of thermal contact conductance for ***dry and pluggable interfaces***, such as pluggable optoelectronic transceiver module

Approach

- Design and fabricate **finned zig zag micro-spring** array
- Develop **metallization**, **surface polishing** and **polymer coating** procedure to enhance thermal conductance
- Construct experimental facilities to demonstrate reliability of the TIM under **10s of cycles** of pressure, temperature and sliding contact
- Thermally demonstrate the applicability of the TIM on a commercial pluggable optical module under a low pressure of **20 kPa**



Top: Working mechanism of the microstructured TIM
Left: SEM image of a single metallized finned zig zag micro-spring



Top: Dimensions of a CFP4 module
Right: CFP4 Module Mated in Host Cage System

Left: The total insertion thermal resistances with and without the TIM inserted, demonstrated by using CFP4 module

Reference

- J. Cui, L. Pan, and J.A. Weibel, *Journal of Electronics Packaging,* Vol. 142(3), 2020
- CFP4 MSA Hardware Specification, Rev. 1.0

Conclusions

- The compliant polymer-coated metallized micro-structured TIM significantly enhance thermal conductance between nonflat and rough surfaces under extra-low pressure of 20 kPa
- The thermal performance of the TIM has little change after pressure, temperature, and sliding contact cycling

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