PURDUE UNIVERSITY

Flexible Foam New Thermal Interface Material

COOLING TECHNOLOGIES RESEARCH CENTER

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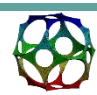
Objectives

- Develop compliant and competitive TIM with a thermal conductive network for low heat flux applications.
- Characterize mechanical deformation, internal and contact thermal resistance of aluminum foams.
- Extend model to generalized porous structure to research optimum structures and materials.

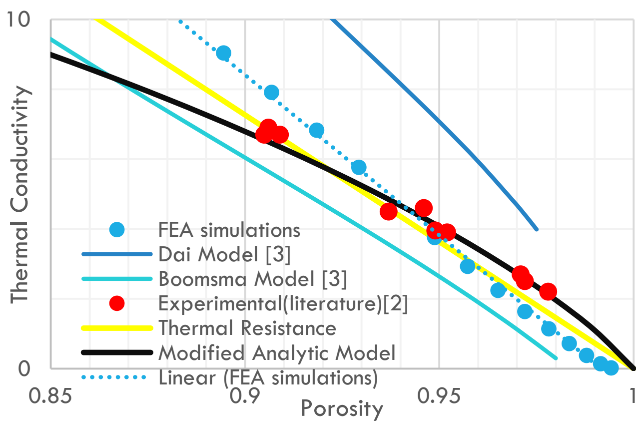
Approach

- Develop models to predict the effective bulk and contact thermal resistances as functions of porosity, pore size, and pressure.
- Validate the thermal resistances through experiments and FEA simulations with aluminum foam samples.

Simulations

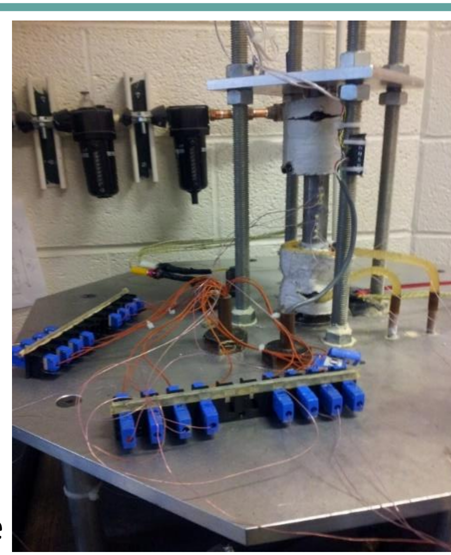


- FEA simulation for effective thermal conductivity



Analytic Models

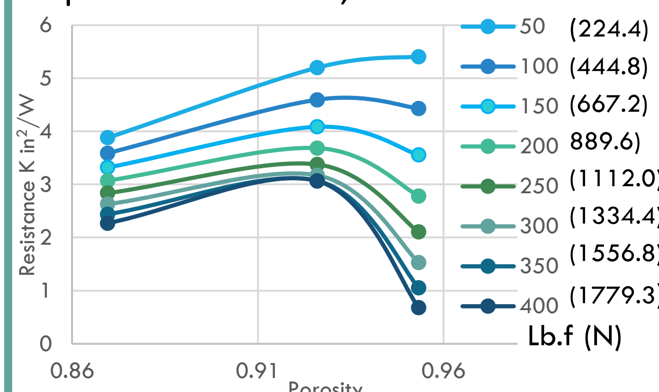
- Timoshenko's beam & Hertz's contact theory
- Effective thermal conductivity models



Current ASTM D5470 setup

Experiments

- Based on ASTM DS5470
- Aluminum foam porosity 87-95%, pore size 2.5 mm, f25.4 mm



Impact

- Find optimum design parameters for currently available aluminum foams.
- Predict thermal performance for alternative network materials and composite matrixes.

References

- [1] Krishnan, S., Murthy, J. Y., & Garimella, S. V. (2006), 128(8), 793-799.
- [2] Calmidi, V. V., & Mahajan, R. L., 1999, Journal of Heat Transfer, 121(2), pp. 466-471
- [3] Boomsma K., Poulikakos D., 2001, International Journal ofHeat and Mass Transfer 44, pp. 827–836.