The current project aims to develop and comprehensively analyze heat transfer through metal foams and other porous media as heat exchanger surfaces, and subsequently use the results to enhance the thermal performance of a heat exchanger and/or reduce its size.

**Objective**

Developed numerical model for estimating pressure drop and heat transfer in periodic porous materials

- Analyzed fluid-thermal performance of various porous-based media heat exchanger as a function of geometry
- Compared lattice frame material (LFM) performance against baseline structures on a unit-cell level and for a “device” case
- Compared to extant experimental data in the laminar regime

**Approach**

- Pyramid structure has 4 cylindrical struts (versus 3 for tetrahedral); this increases surface area density without much additional flow blockage
- With increasing porosity, pressure drop is lowered and the Nusselt number is increased (increased absolute velocity at higher porosity)
- LFM structures have a better overall performance than the metal foams and copper textiles for the $\text{Nu}_{\text{lf}}/f$ performance factor

**Impact**

- Porosity=77%
- Porosity=86%
- Porosity=95%

**Publications**