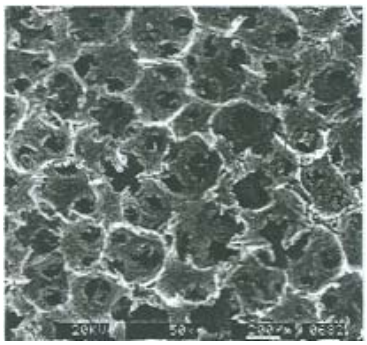
Air-Conditioning and Refrigeration Technology Institute

Project Summary

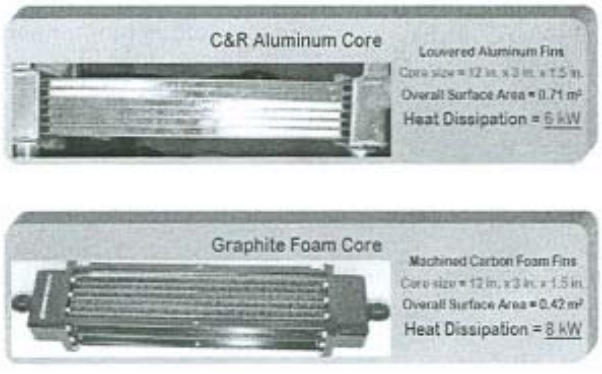
Novel Materials for Heat Exchangers



Micrograph of Carbon Foam

Design of heat exchangers for air conditioning, refrigeration and energy recovery systems have a significant impact on overall energy efficiency, capacity, cost, and size of HVAC&R systems. Industry has historically utilized fairly traditional designs for heat exchangers; primarily fin-and-tube, shell-and-tube or plate-type heat exchangers that typically use copper and/or aluminum for tube and fin construction. However, recent advances in material science have yielded novel concepts in the use of other materials for heat exchangers that may increase heat transfer, reduce the heat exchanger size, or reduce its cost. These novel materials include lattice frame metals and alloys, carbon and graphite foams, plastic and polymeric materials, ceramics and other materials. Although some novel materials have been used in the automotive and other industries, there has been little investigation of the application of these materials in heat exchangers for residential and commercial HVAC&R systems.

Researchers have reviewed the literature to identify novel materials that are suitable for use in heat exchangers for various HVAC&R applications including comfort cooling, refrigeration, heat wheels and energy recovery. They identified potential novel materials, collecting and compiling relevant physical properties and material costs data, and comparing that data with those for conventional materials to determine which novel materials are suitable for use in HVAC&R systems. A metal foam and a hybrid novel design will be fabricated, tested, and modeled in a follow on project.



Aluminum Core and Graphite Foam Core Automotive Radiators

Contractor: University of Illinois at Urbana-Champaign
Principal Investigator: Anthony M. Jacobi, Ph.D.
Start-date: 10 November 2006; Current End-date: 31 December 2007; Final report is under review.
Revised: 04/08/2008