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Flexible heat exchangers with polymeric hollow fibers

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Polymeric hollow fiber heat exchangers were proposed about decade ago as an alternative to metal exchangers for low temperature application. Design of classical metal heat exchangers is limited by production technology. Majority of metal heat exchangers are of rectangular shape and the use of polymeric flexible materials brings new chance of production of light heat exchangers with almost arbitrary shapes. Two types of polymeric heat exchangers can be distinguished: The first is in the shape of chaotic bundle (Fig. 1) and the second is design with regularly separated heat transfer capillary (Fig. 2). Flexible polymeric hollow fiber heat exchangers were prepared and tested for liquid / air and liquid / liquid conditions. These heat exchangers use plastic capillary with outer diameter 0.5 - 0.8 mm and wall thickness 10% of outer diameter. These heat exchangers are flexible and can be used in narrow slots and in shaped channels. Experimentally obtained overall heat-transfer coefficients in water/air applications are up to 900 W/m^2 K. These heat exchangers are effective even in natural convection application where advantage of high heat transfer coefficient on micro surfaces is used. The use of plastic and non-corrosive materials is advantageous in applications where weight of heat exchanger is important (about 50% reduction of weight in comparison to classical metal products) and in difficult chemical environment. The paper present results of laboratory tests of the developed prototypes of polymeric hollow fiber heat transfer surfaces of variety of designs.

Figure 1: Heat transfer bundle with chaotic hollow fibers

Figure 2: Separated fibers in heat transfer surface

Recent Publications

1. Krásný, I, Astrouski I and Raudenský M (2016) Polymeric hollow fiber heat exchanger as an automotive radiator. Applied Thermal Engineering 108:798-803.

2. Brožová T, Luks T, Astrouski I and Raudenský M (2016) Fatigue testing of polymeric hollow fiber heat transfer surfaces, by pulsating pressure loads. Applied Mechanics and Materials 821:3-9

Biography

Miroslav Raudensky is a Professor at Brno University of Technology. He is author or co-author of over 200 technical and research reports mainly for mechanical engineering and metallurgical industry. His main research interest is in experimental study of heat transfer, especially for high temperature and micro surface application. He has published over 70 papers in that field.

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