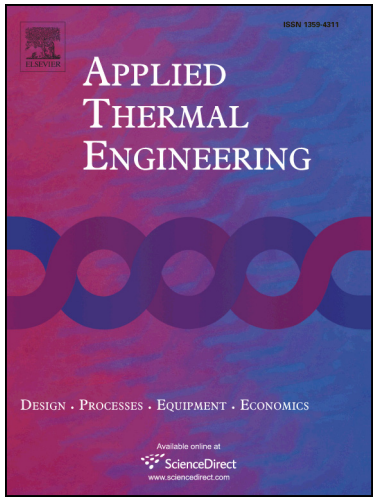

Research Paper

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Heat Transfer Enhancement in Annular Flow with Outer Grooved Cylinder and Rotating Inner Cylinder: Review and Experiments

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ABSTRACT

This experimental work is an attempt to identify the most significant parameters influencing heat transfer enhancement in annular flow with outer grooved cylinder and rotating inner cylinder. This type of flow known as Taylor-Couette flow has many industrial applications such as electrical power generators and rotating machineries. A comprehensive review of the previous works on flow regimes, heat transfer and pressure drop in grooved channels is provided. The experiments are conducted based on four different factors including Taylor number, $0<Ta<8.36\times10^6$; groove aspect ratio, $0<b/c<2$; number of grooves, $0<N_{gr}<20$ and wall temperature, $50<T_w<90^{\circ}C$. Among four different test cases, the average Nusselt number of the model with aspect ratio *b/c*=2 is higher than the other three cases, i.e., $b/c=0,0.5,1$. It is found that in the presence of grooves, the thermal entrance length in rotating channel is reduced about 17% due to perturbation and vorticity of the flow inside the channel. Finally, the results are analyzed according to the principle of response surface methodology. It is found that, heat transfer enhances significantly with increasing groove aspect ratio and rotational speed.

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