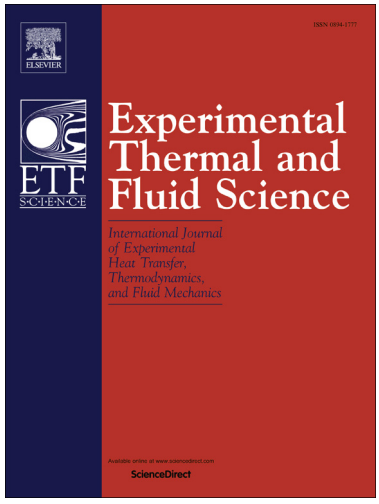

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The effect of heat transfer enhancement on the crystallization fouling in a double pipe heat exchanger

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Abstract

Experimental work was carried out to study the effect of surface enhancement on the crystallization fouling in a double pipe heat exchanger under forced convective heat transfer. The experiments were performed using a hot fluid (salt solution) that had a temperature of 40 °C and Reynolds number range between Re_h= 5300 and 20000. The normal solubility salt (sodium sulfate, Na_2SO_4) was used at its saturation concentration. The temperature of the cold fluid (distilled water) was 10 ^oC and Reynolds number (Re_c) range was between 13000 and 22000. The cold fluid was pumped through the inner tube and the hot fluid was pumped counter currently through the outer tube. This caused the sodium sulfate to precipitate on the outside surface of the tube. The impact of scale fouling on the heat transfer coefficient and fouling resistance was investigated for both a smooth and an enhanced surface. The effect of surface enhancement on the fouling process was studied by installing a coiled wire insert on the inside or outside surface of the inner tube. The results revealed that the surface enhancement increased the heat transfer rate by 150 % to 180% depending on Re_h and Re_c. In addition, it significantly decreased the fouling resistance (R_f). It was found that installing the coiled wire insert onto the outer surface of the inner tube is more effective in reducing fouling resistance than installing it on the inside surface of the inner tube. At low Re_c and Re_h, the surface