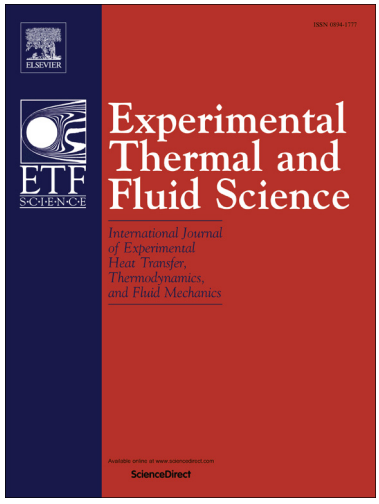

Heat transfer and friction factor correlations for a solar air heater duct roughened artificially with broken arc ribs

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Heat transfer and friction factor correlations for a solar air heater duct roughened artificially with broken arc ribs

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Abstract: In present experimental investigation, solar air heater duct with aspect ratio 12 roughened with broken arc rib has been investigated. The broken arc was formed by creating symmetrical gap in continuous arc. To investigate the influence of roughness parameters of broken arc rib on Nusselt number as well as on friction factor, thirty seven broken arc rib roughened plates having relative roughness pitch (P/e), relative gap width (g/e), relative gap position (d/w), relative roughness height (e/D_h) and arc angle (α) varying from 4-12, 0.5-2.5, 0.2-0.8, 0.022-0.043 and 15°-75° respectively, have been investigated for Reynolds number range of 2000-16000. Keeping similar flow conditions, results of broken arc rib roughened duct have been compared with smooth and continuous arc rib roughened ducts. The maximum increase in Nusselt number and friction factor over that of continuous arc rib roughened duct was 1.19 and 1.14 times respectively. The corresponding values over that of smooth duct were 2.63 and 2.44 times respectively. Experimental results of heat transfer and friction in flow have also been correlated in terms of flow and roughness geometry parameters.

Keywords: Solar air heater; Friction factor; Rib roughness; Artificial roughness; Nusselt number

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