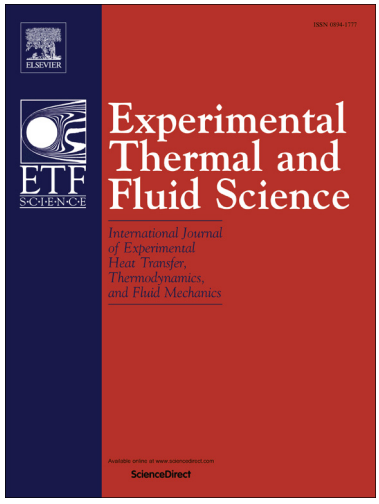

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Experimental Investigation of the Inlet Condition on Jet Impingement Heat Transfer Using Liquid Crystal Thermography

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Abstract

This paper reports the results of an experimental study to investigate the local and average convective heat transfer coefficients from a single jet and a row of jets impinging over an unheated flat plate. A thermochromic liquid crystal technique is used to visualize the temperature distribution on the impingement surface and the semi-infinite approximation methodology is used to extract the local heat transfer coefficients. Measurement of potential core length and turbulence intensity have also been carried out using hotwire anemometry. Results are presented for jet Reynolds numbers 5000, 10000 and 15000 with varying separation distances (normalized distance between jet and the target plate (L/D)) of 2, 4 and 6 for four different jet configurations namely, single orifice, single nozzle, a row of orifices and a row of nozzles. A comparison of heat transfer characteristics of the single orifice with the single nozzle and the row of orifices with the row of nozzles is reported. The measured stagnation Nusselt number is found to be correlated to the jet characteristics such as potential core length and turbulence intensity. Correlations are developed for Nusselt number as a function of Reynolds number and separation distance.

Keywords: Jet impingement heat transfer, Thermochromic Liquid Crystal, Heat transfer coefficient.

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