

Abstract

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Correlations of Natural Convection in Open-Ended Eccentric Inclined Annuli: (Experimental Study)

An experimental investigation of a steady natural heat transfer in eccentric annuli whose inner cylinder is subjected to constant heat fluxes (uniformly heated surface using electric heaters) for different inclination angles while the outer cylinder is thermally insulated. The eccentricity ratio (E) varied from 0 (concentric) to 1 (maximum eccentricity) with a step of 0.25. The inclination angle (θ) varied from 0° to 90° while the modified Rayleigh number varied from 69 to 473. The Rayleigh number range was from 4930 to 33786 while the modified Rayleigh number varied from 69 to 473. The study had examined the parameters of Rayleigh number & its effect on the average Nusselt number for each case. The results revealed the correlated empirical equations based on the experimental results recorded by a set of thermocouples & provided the maximum percentage error for each case. Furthermore, a final correlation using symbolic regression analysis is proposed to solve the average Nusselt number based on the variation of the eccentricity ratio, the inclination angle, and the Rayleigh number.