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Study on analysis of ionic wind for heat transfer enhancement. HAN SEO KO, DONG HO SHIN, Sungkyunkwan University — Local heat transfer technology was investigated using ionic wind generation in this study. Characteristics of ionic wind using wire and plate electrodes were studied by experimental and numerical methods. A particle image velocitimetry (PIV) test was conducted for a study of a boundary layer controlled by the ionic wind on the heated surface in the wind tunnel. It was found that the coulombic force consistently acted on the surface to reduce the effect of the viscous boundary layer. The boundary layer was formed on the heated surface and controlled by the ionic wind regardless of the Reynolds number of the bulk flow. The heat transfer coefficient increased and decreased, 11% and 19% in average on the heated surface by the ionic wind, for the condition of lower (100˜200) and higher (2500˜3500) Reynolds numbers of the bulk flow, respectively. It was concluded that the ionic wind can be used for enhancing the convection heat transfer rate or insulating the local surface according to its operating condition. The results of the local heat transfer controlled by the ionic wind were applied for the heat exchanger and the performance was confirmed by the experimental and numerical methods.

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