STUDY OF CONVECTIVE HEAT TRANSFER IN EFFUSIVE HEATING

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Convective heat transfer of turbulent cold boundary layer on a porous flat plate with injection of hot air is studied. The objective of the project is to investigate the influence of the control parameters such as blowing factor and porous structure, on the effusive heating process. Both numerical and experimental approaches are considered.

The numerical study is performed using the commercial software FLUENT 6.0. Numerical simulations of the main flow are performed using the Realizable k-ε model of turbulence and the porous plate is simulated as a "Porous zone".

During the experimental investigation, two different plates, a porous bronze matrix and a thin micro-drilled titanium sheet, are successively tested in the Cold Wind Tunnel (CWT) facility. Each porous plate stands as the bottom wall of the wind tunnel the test section of which is shown by the photography of figure 1. An infrared thermography camera measures the temperature distribution on the porous wall. Dedicated windows transparent to IR radiations are inserted in the upper wall of the tunnel, made of Plexiglas.

The results show that the efficiency of the effusive heating is higher for the titanium plate. In figure 2 the Stanton number change obtained by effusive heating is compared to conventional convection over a flat plate.

Figure 1. Test section view with the porous plate on the bottom wall

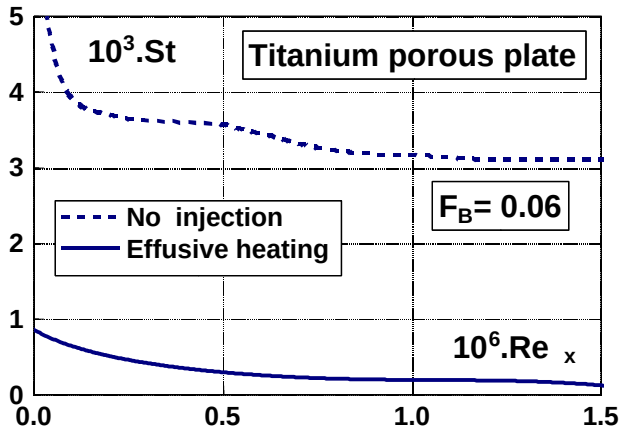

Figure 2. Downwind distribution of the Stanton number