free-stream turbulence and of separeted angles on heat transfer characteristics in the reattachment region under the condition of a two-dimensional The turbulence intensity T_u and the separeted angle 2θ were controlled by varying the vertical angle of the triangular cylinder with a tail plate, and the mesh of turbulent screen, respectively. The effect of T_u on the reattachment length X_r was found to be not uniform with respect to 2θ.

The maximum heat transfer coefficient h_{max} was obtained at the point that appears in the upstream side of the reattachment point by about one step hight, for all combinations of 2θ and T_u employed in this study. The value of h_{max} increases with a decrease in X_r. The decrease results from an increase in T_u or a decrease in 2θ. It was found to be inappropriate, however, to relate both h_{max} and X_r either directly or quantitatively. The change in h_{max} with 2θ and T_u may rather depend upon both changes in the following properties (1) the maximum gradient of wall static pressure in the recirculation region; and (2) the maximum intensity of pressure fluctuation.

*Faculty of Engineering, University of Gifu, 1-1, Yanagido, Gifu, 501-11, Japan

**Prefectural office of Gifu, 1-1 Yabuta, Gifu, 500, Japan

Flow Boiling in Tube of Mixtures of Refrigerants R-11 and R-113

by Shigeyasu NAKANISHI, Masuo KAJI**, Hiroyuki MATOBA*** and Nobuyuki KAJI** High Quality flow boiling in tube of non-azeotropic binary mixture was experimentally investigated using mixtures of refrigerants R-11 and R-113 as working fluids. The experimental set-up consisted of a test section made of a 304 stainless steel tube with 7 mm.

I. D., which was placed vertically in a low pressure heat transfer test rig (its maximum pressure was 0.5 MPa). The test section was uniformly heated by direct resistance heating. The data of heat ransfer coefficient were correlated in the form of two-phase to single-phase liquid heat transfer coefficient ratio versus Lockhart-Martinelli parameter. The CHF data were correlated in terms of the critical quality. According to the correlation results, the linear mixing rule for composition does hot hold for the heat transfer coefficient, while it does holds for the critical quality.

*Himeji Institute of Technology, 2167, Shosha, Himeji, 671-22, Japan

**Faculty of Engineering, Osaka University, 2-1, Yamad-Oka, Suita, 565, Japan

***Kashima Works, Sumitomo Metal Co.; Kashima-cho, Ibaraki, 314, Japan

Latent Heat Thermal Energy Storage by Using Binary Mixture

by Kunio HIJIKATA, Nobuhiro HIMENO*, Hiroyuki MIYASAKA**, Kazuhito SAITO**, and Yasuo MORI* Latent heat thermal energy storage is investigated by using a binary mixture of p-$C_6H_4Cl_2$ and p-$C_6H_4Br_2$ as a heat storage material. In solidification of a binary mixture, the melting temperature changes due to the variation of the mixing ratio are caused by the segregation. Two solidification models are proposed for a theoretical analysis. In the first model, the solidification increases in the direction of the heat flow.

In the other, it is assumed that the segregation grows perpendicularly to the heat flow, which corresponds to a dendritic solidification. The former model can be well applied in the low mixing ratio of p-$C_6H_4Cl_2$ and the latter can be used in the high mixing ratio. The temperature profile also changes in accordance with the initial mixing ratio of the two materials; however, the variation of the transfered heat from outside with time is quite similar to that of pure material. The effect of free convection on heat storage performance is also investigated by changing the direction of the heat input or output.

*Tokyo Institue of Technology 2-12-1 Ohokayama, Meguro-ku, Tokyo, 152, Japan

**Tokyo Institute of Technology University of Electro-Communication, 1-5-1, Chohugaoka, Chohu, Tokyo, 182, Japan

Line Reversal Temperatures in Ionization Relaxation Flows behind Ar Shock Waves Containing a Small Amount of NaCl

by Katsuine TABEI and Hiroyuki SHIRAI In the ionization relaxation regions behind Ar shock waves containing a small amount of NaCl, the behavior of Na D line reversal temperature (Na excitation temperature) has been investigated theoretically. In order to obtain Na spectral radiation properties, the rate equation based upon a collisional and radiative model has been constructed, and coupled with the conservation equations ovberning the ionization relaxation flows, and with non Maxwellian energy distribution functions for free electrons. The numerical calculations have been performed systematiclly for the conditions of shock Mach number $M=8 \sim 12$ and the admixture ratio of [NaCl] to [Ar] $\theta=10^{-6} \sim 10^{-4}$. It is found that the excitation temperature of the Na D spectral line, reflecting a non-equilibrium state of Na excited levels, is fairly lower than electron and atom temperatures in the whole course of relaxation; and that the excitation temperature depends largely on θ at low Mach numbers, namely, it becomes large toward the electron temperature as θ increases.

Faculty of Technology, Gunma University, 1-5-1 Tenjin-cho, Kiryu, Gunma, 376, Japan

Buoyant Plume above Concentrated Heat Source in Stratified Porous Media

by Takashi MASUOKA, Yuji TOHDA**, Takaharu TSURUTA*, and Yoshiaki YASUDA** Buoyant plume arising from a point heat source and a line heat source in stratified porous media is investigated analytically and experimentally.