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TWO PHASE FLOW OF THE CONDENSATION BOUNDARY LAYER THROUGH POROUS MEDIUM

Shubha Devi Yadav

Department of Mathematics,
D. A. V. P. G. College, Lucknow, Lucknow (UP), India.
E-mail: shubha.yadav70@gmail.com

Abstract: In this paper, condensation heat transfer and the structure of the dispersed, two-phase, two-component boundary layer are studied under forced convection condition and through porous medium.

Keywords and Phrases: Two phase, two component flow, porous medium, boundary layer.

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1. Introduction

Hijikata and mori [1] assumed that vapour is saturated throughout the boundary layer and that droplet appear to avoid any metastable state of vapours. They neglected the heat resistance of the film, assuming that the temperature of the interface, between the liquid film and the dispersed two-phase medium was equal to the temperature of the plate of surface.

Legay [2] and Legay and Prunet [3] solved the two phase boundary layer equation, numerically by a finite difference method. Hijakata and Mori [1] pointed out that, in case of Le < 1 and for low temperature difference , a condensing vapour is in a superheated state in the single phase boundary layer. However, they did not show any numerical results to support such a statement. Further, no attention has been given to this problem in Legay [2] and Legay and Prunet[3,4] where no numerical values of droplet mass fraction were presented. At the same time, droplets were not observed in the experiment with a steam-air mixture by Legay [2] unless the temperature difference was > 20K.

These results compelled researches to deal with forced convection condensation in the presence of non-condensing gas to examine carefully the intrinsic consistency of the models based on saturated condition throughout the boundary layer. So