8

Porous Media Enhanced Forced Convection Fundamentals and Applications

José L. Lage and Arunn Narasimhan
Southern Methodist University, Dallas, Texas

I. INTRODUCTION

What is *enhanced heat transfer*? According to Webster's Dictionary (1995), the word *enhance* means "to raise to a higher degree, to intensify, to increase the value, attractiveness, or quality of, to improve." Hence, enhanced heat transfer is a heat transfer that has been improved. An important subsequent question is: *How can heat transfer be improved*? The answer to this question is simple: *Heat transfer can be improved by reducing the thermal resistance of the transfer process*. This is what *enhancing heat transfer* is all about!

It is well known that the heat transfer relation between heat flow (or *current*) and temperature difference (or *potential difference*) depends on the heat transfer mode, i.e., it depends on heat being transferred by diffusion, convection, and/or radiation. In convection heat transfer the general relation between heat q and the driving temperature difference is

$$q = hA(T_w - T_{\text{ref}}) \tag{1}$$

where the parameters are defined in the nomenclature. In Eq. (1), the potential driving the heat transfer is $(T_w - T_{\text{ref}})$ and the thermal resistance is $1/(hA)$.

Keep in mind that Eq. (1) is the definition of the thermal resistance $(1/hA)$, or, more specifically, the definition of the convection heat transfer coefficient h. Another important observation is that q and $(T_w - T_{\text{ref}})$ are

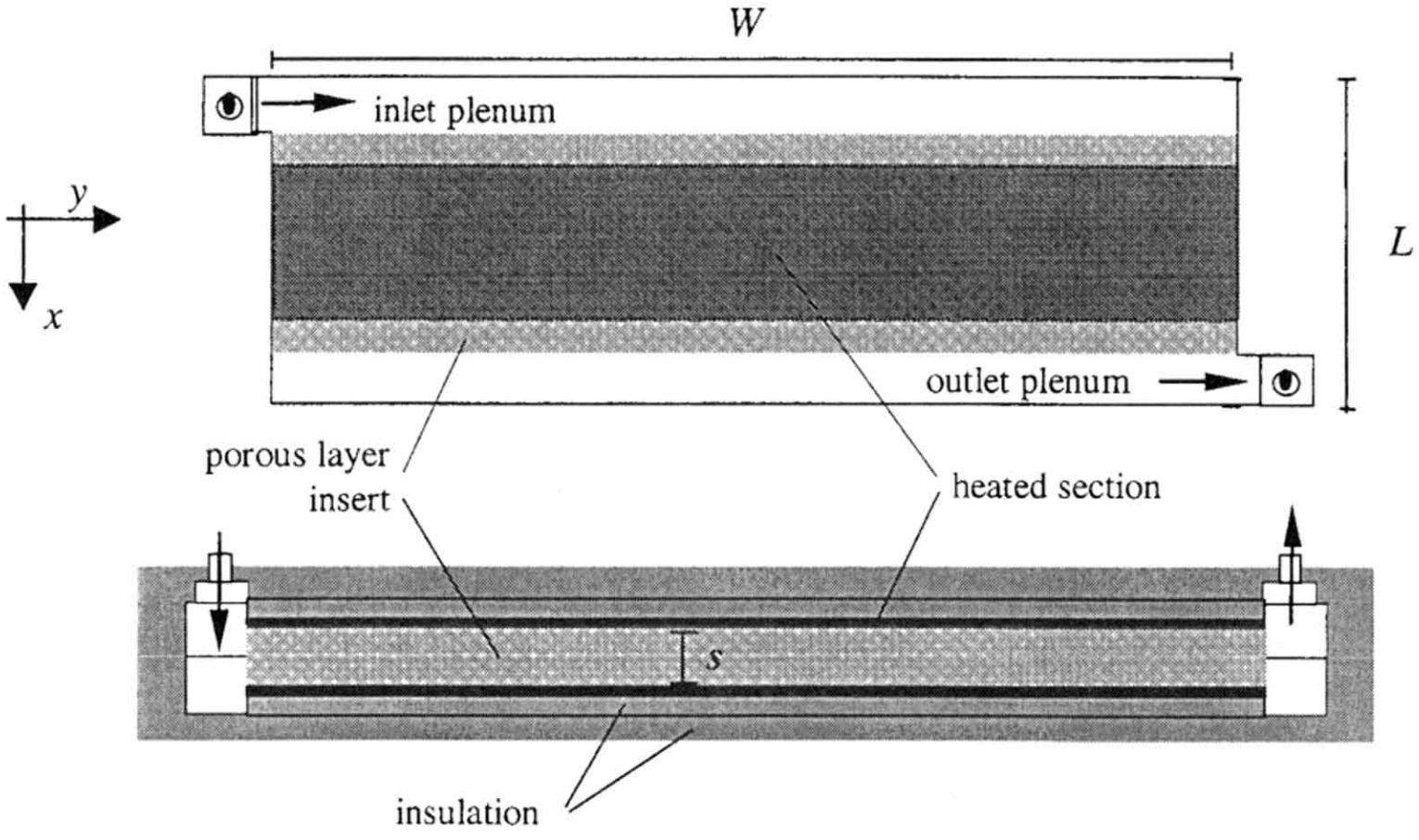

Figure 6. Microporous enhanced cold plate configuration studied by Porneala et al. (1999).