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## ***Experimental Study of the Effect of Firing Rate and Equivalence Ratio on Performance of a Porous Metal Radiant Burner***

S. A. Hashemi, M. Nikfar and R. Motaghedifard

### ***ABSTRACT***

In this paper, the performance of a metal porous radiant burner is investigated experimentally. To study the effect of firing rate and equivalence ratio, some tests have been carried out in five different firing rates and in a range of equivalence ratios which the flame is stable in the porous media. These parameters have been investigated on three porous media, which are formed from fine and coarse meshes. The results show that the surface temperature increases with increasing firing rate. In each firing rate, the equivalence ratio corresponding to the maximum temperature is determined. The maximum temperature occurs in equivalence ratios less than one (0.7-1) and Radiation efficiency of the burner decreases with increasing firing rate. The maximum radiation efficiency takes place in equivalence ratio corresponding to the maximum surface temperature. In a specific firing rate, the maximum temperature for the combined porous media (two layers of fine mesh and one layer of coarse mesh) occurs in an equivalence ratio less than that of the other porous media. The obtained results are in a good agreement with the other studies.

**KEYWORDS** :Metal porous media, combustion, radiant burner, Radiant efficiency, firing rate, equivalence ratio

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(ZrO<sub>2</sub>)

(SiC)

(Al<sub>2</sub>O<sub>3</sub>)

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W/mK

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$$\varphi = \frac{FAR}{FAR_s}$$

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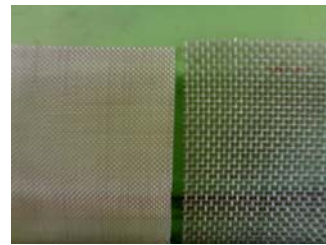
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$$FR = \frac{LHV \times \dot{m}_f}{A}$$

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kW/m<sup>2</sup>

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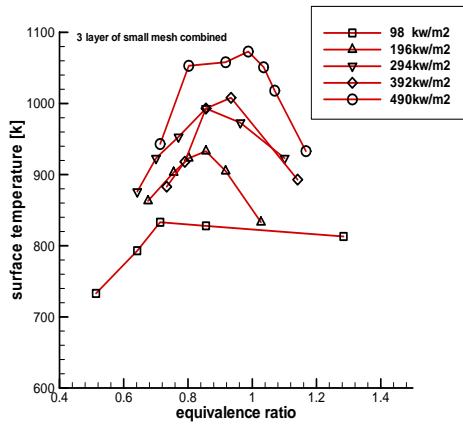
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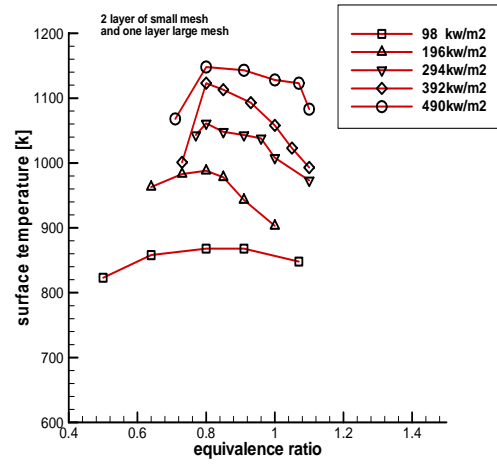


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kW/m<sup>2</sup>  
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kW/m<sup>2</sup> kW/m<sup>2</sup>

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$$\eta_{rad} = \frac{Q_{rad}}{FR}$$

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Q<sub>rad</sub>

$$Q_{rad} = \varepsilon \sigma (T_{surf}^4 - T_{surr}^4)$$

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	kW/m <sup>2</sup>				
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	/	/	/	/	/
	/	/	/	/	/

	kW/m <sup>2</sup>				

$$\sigma \quad \varepsilon ( )$$

$$T_{surr} \quad T_{surf} \quad (\sigma = / \times w/M^2k^4)$$

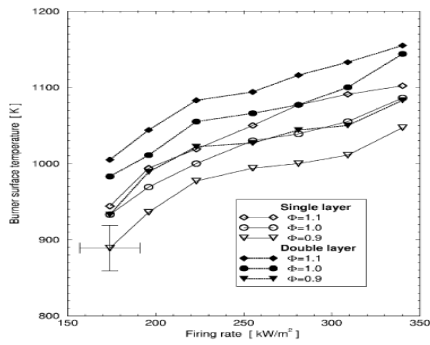
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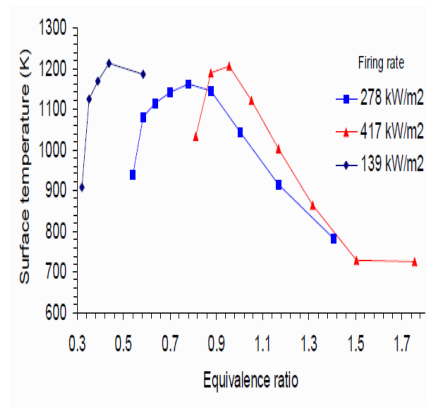




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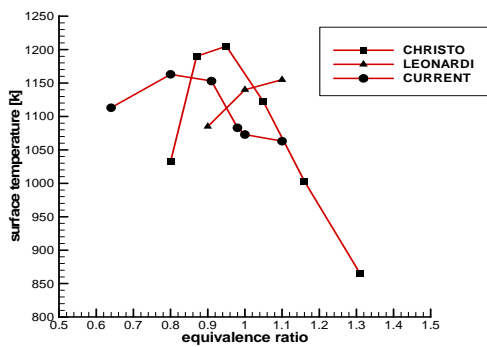
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kW/m<sup>2</sup>  
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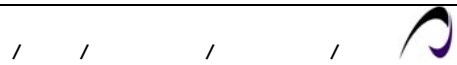
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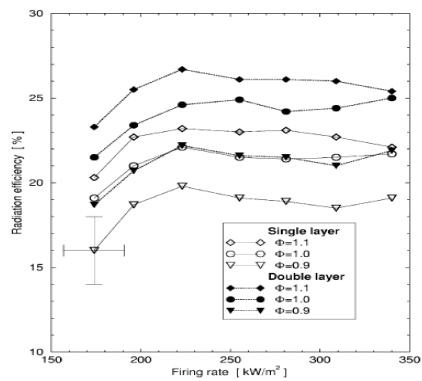
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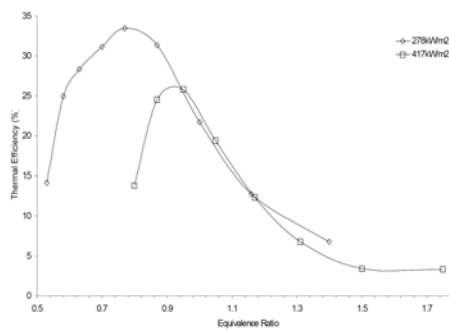
$$W_R = \left( \sum w_i \left( \frac{\partial R}{\partial X_i} \right)^2 \right)^{0.5}$$

$w_i$

$X_i$

$W_R$

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kW/m² kW/m²

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kW/m²

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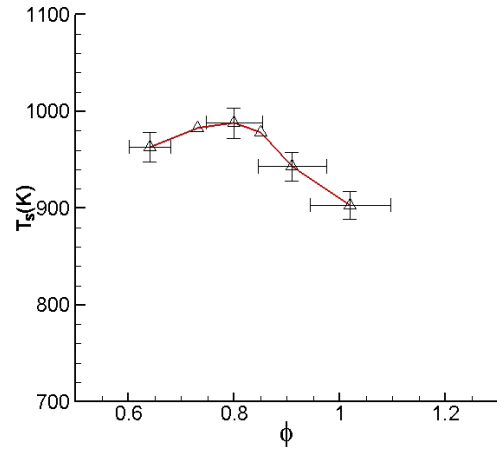
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kW/m<sup>2</sup>

T<sub>s</sub>

FR=



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<sup>1</sup>turn down ratio

