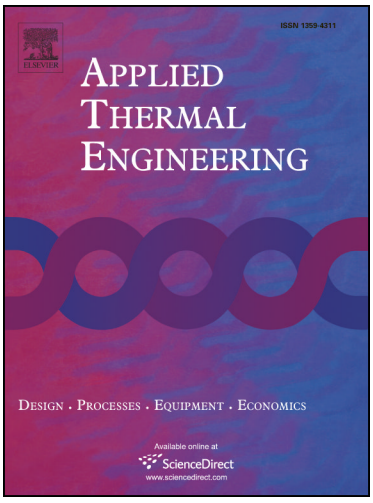

Research Paper

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Experimental and numerical investigations on diffusion filtration combustion in a plane-parallel packed bed with different packed bed heights

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Abstract

This work presents experimental and two-dimensional numerical investigations on the combustion characteristics of a plate-parallel diffusion filtration combustor with different packed bed heights. Experimental results show that two types of flame, namely, the immersed flame within the packed bed (flame Ⅰ) and the surface flame above the pellets (flame Ⅱ), coexist in the combustor for bed height $40\,\text{mm} \le h \le 160\,\text{mm}$. Two luminous zones, which denote the reaction zone and the flame shape of the diffusion filtration combustion within the packed bed, are founded for $40\,\text{mm} \le h \le 160\,\text{mm}$. For flame Ⅰ,the width of the reaction zone is small and this is the feature of diffusion combustion. However, temperature measurement by infrared thermal imager shows that a wide high temperature zone locates in the packed bed, the temperature distribution is different from that of the typical diffusion combustion. The high temperature zone propagates downstream and its width in flow direction is enlarged as h increases. The diffusion filtration combustion is numerically simulated by two-dimensional and two-tempeprature model, in which the burner wall

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