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РАДИАЦИОННЫЕ ГОРЕЛКИ ЦИЛИНДРИЧЕСКОЙ ФОРМЫ С МАКСИМАЛЬНОЙ ЭФФЕКТИВНОСТЬЮ ПРЕОБРАЗОВАНИЯ ЭНЕРГИИ ГОРЕНИЯ В ИЗЛУЧЕНИЕ*

А. С. Мазной[1], А. И. Кирдяшкин[2], Н. С. Пичугин[3]

Аннотация: Экспериментально исследован радиационный коэффициент полезного действия горелок с полым цилиндрическим излучателем из интерметаллидного сплава Ni–Al при работе во внутреннем режиме, когда горение метановоздушной смеси организуется в объеме излучателя. Изучены зависимости радиационного коэффициента полезного действия (КПД) от параметров структуры излучателя, удельной мощности горелки и коэффициента избытка воздуха. Установлено, что в зависимости от условий цилиндрические горелки характеризуются радиационным КПД от 60% до 30%. Приведены количественные оценки максимально возможного радиационного КПД горелок в зависимости от удельной мощности, состава топливной смеси и коэффициента черноты излучателя. Показано, что радиационный КПД горелок с цилиндрическим излучателем со средним размером элементов скелета 600 мкм во всех изученных режимах работы близок к максимально возможному.

Ключевые слова: радиационная горелка; инфракрасная горелка; пористая горелка; КПД

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[1]Томский научный центр Сибирского отделения Российской академии наук, maznoy_a@mail.ru
[2]Томский научный центр Сибирского отделения Российской академии наук, kirdyashkin_a@mail.ru
[3]Томский научный центр Сибирского отделения Российской академии наук, pichugin.n.s@inbox.ru

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CYLINDRICAL RADIANT BURNERS WITH MAXIMAL RADIATION EFFICIENCY

A. S. Maznoy, A. I. Kirdyashkin, and N. S. Pichugin

Tomsk Scientific Center, Siberian Branch of the Russian Academy of Sciences, 10/4 Prosp. Akademicheskiy, Tomsk 634021, Russian Federation

Abstract: The radiation efficiency of burners with hollow cylindrical emitters operating in the internal combustion mode, when the fuel mixture completely reacts in the volume of emitter, was experimentally investigated. The effect of porous structure of the intermetallic Ni–Al emitter, firing rate, and the methane–air ratio was discussed. The investigations were performed by means of direct power measurement of the infrared flux taking into account the requirements of international standards. It was found that the cylindrical burners possess the radiation efficiency from 60% to 30% depending on the conditions. Quantitative assessment of the maximal possible radiation efficiency of burners depending on the firing rate, the composition of the fuel mixture, and the emissivity of the emitter has been performed. It has been shown that the radiation efficiency of the cylindrical burners with an average size of the skeleton elements of 600 μm is close to the maximum possible efficiency in all experimentally studied conditions.

Keywords: radiant burner; infrared burner; porous burner; radiation efficiency

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Contributors

Maznoy Anatoly S. (b. 1985) — Candidate of Science in technology, research scientist, Tomsk Scientific Center, Siberian Branch of the Russian Academy of Sciences, 10/4 Prosp. Akademicheskiy, Tomsk 634021, Russian Federation; maznoy_a@mail.ru

Kirdyashkin Alexander I. (b. 1954) — Candidate of Science in physics and mathematics, head of laboratory, Tomsk Scientific Center, Siberian Branch of the Russian Academy of Sciences, 10/4 Prosp. Akademicheskiy, Tomsk 634021, Russian Federation; kirdyashkin_a@mail.ru

Pichugin Nikita S. (b. 1995) — engineer, Tomsk Scientific Center, Siberian Branch of the Russian Academy of Sciences, 10/4 Prosp. Akademicheskiy, Tomsk 634021, Russian Federation; pichugin.n.s@inbox.ru