STABILIZATION OF SURFACE COMBUSTION IN INFRARED BURNER DEVICE

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Abstract: A method for stabilization of surface combustion in an infrared (IR) burner device by controlling the matrix surface temperature is proposed. The signal from the photoelectric sensor located near the radiating matrix surface controlles the air flow using an electronic unit in such a way that provides an almost constant temperature of the radiating matrix surface. For the matrix from a corrugated metal foil, stable surface combustion of natural gas with air is provided without any flashback or flame blow-off in the parameter region where the normal combustion is impossible. The stable surface combustion is realized in IR-mode at an almost constant high temperature of the matrix surface of ~ 1000 °C under the specific power of 60 W/cm^2 despite periodic depletion of the mixture with the excess air coefficient variation from 1.05 up to 1.35.

Keywords: surface combustion; infrared burner; combustion stabilization; specific power

DOI: 10.30826/CE20130104

Figure Captions

Figure 1 Scheme of the method (*a*), photo of the matrix (*b*), and photo of burner operation (*c*)

Figure 2 The domain of stable combustion in the IR-mode. Point A corresponds to stable combustion at a matrix surface temperature of 990 °C

Figure 3 An oscillogram of the experiment at $w = 60$ W/cm^2 and $t_0 = 15.4$ s. The scales of signals J and U are arbitrary

Figure 4 The temperature oscillations T_1 and the maximum surface temperature of the matrix T_s for stabilized combustion at $w = 60$ W/cm^2 depending on the control period

Figure 5 Phase portrait of stabilized combustion

Acknowledgments

The author would like to thank the FRC CP RAS for its attention to this study conducted within the state task on topic 44.8 “Fundamental studies of the conversion processes for energy-capacious materials and development of scientific basis for controlling these processes.” State registration number is AAAA-A17-117040610346-5.

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Received January 13, 2020

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