HIGH EFFICIENCY HEAT-RECIRCULATING DOMESTIC GAS BURNERS

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Existing designs of most conventional domestic burners (CB) have typically on open combustion flame, where a large amount of energy loss with the flue gas arises, resulting in relatively low thermal efficiency (<30%). Against this background, a novel semi-confined porous radiant recirculated burner (PRRB) concept based on heat-recirculating combustion using the porous medium technology was developed for energy savings in domestic use and in the small-scale food processing industry. Performance of the new burner using the same ring burners as those in the CB, i.e. the PRRB (CB) were evaluated by comparing thermal efficiencies and the combustion characteristics with those of the conventional one (CB). Operating parameters such as heat input, flow type of the ring burners (conventional radial flow (CD) or swirling central flow (SB)) were clarified. The proposed PRRB(CB) is very effective in establishing a heat-recirculation mechanism from the hot exhaust gas to the combustion air, resulting in efficient combustion air preheating with maximum combustion air temperature of 300 ^{o}C. Thermal efficiency of the proposed PRRB (CB) is increased to about 12% higher than that of the conventional one (CB). Further improvement in thermal efficiency of the burner can be realized by combining the PRRB with the swirling central flame ring burner (SB), i.e. the PRRB (SB), yielding a maximum thermal efficiency of about 60% and, thus, energy saving of about 50% average over the operating range. The proposed PRRB (SB) provides not only high thermal efficiency and considerable improvement in energy saving but also environmentally compatible emissions. With the model proposed, the calculated thermal efficiencies of the PRRB(SB) can be predicted and agree well with the experimental ones.