PARTIALLY COATED $LaMnO_3$ MONOLITHS AS HIGH PRESSURE CH_4 CATALYTIC COMBUSTOR

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Catalytic combustion (CC) has been proposed as an alternative route to produce energy in an environmental friendly and safe manner. A suitable catalyst should have high activity at low temperature, mechanical resistance, low cost, thermal resistance. Noble metal catalysts are very active at low temperature but they are very sensitive to thermal stresses.
A promising alternative is represented by perovskite based catalyst and in particular, $LaMnO_3$ [1]. Anyway, catalytic combustors have to face with problems of thermal control to avoid the formation of hot spots and the consequential catalyst deactivation. Moreover, their cost is mainly related to the active phase, independently from kind (noble metal or transition metal oxide).
In a previous paper we found that in monolithic combustors run at pressure relevant to gas turbine combustors (up to 12 bar) the catalytic reaction provides ignition while methane complete conversion is obtained thank to the activation of the homogeneous reaction [2]. We then proposed to develop a partially coated monolith, catalyst being deposited only over the external channels (core-shell configuration) [3]. CFD simulations of this configuration showed that the catalyst reaction allows activation of the homogeneous reaction also in the not-coated channels thus providing the complete CH_4 conversion in the whole monolith. In this work, we present the experimental results which confirm that a partially coated monolith may provide the complete methane conversion in a wide range of operating pressure and flow rate.

References

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