Evaluation of total catalytic oxidation of light hydrocarbons under lean conditions over $La_{1-x}Sr_xMnO_3$ perovskites.

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In recent years, urbanization and industrialization have degraded ambient air quality. Both the increasing use of natural gas - as an environmentally friendly source of energy- and various industrial activities contribute to the increase of unburned CH_4 and volatile organic compounds (VOCs) emissions, enhancing the "greenhouse effect" and the formation of secondary pollutants and photochemical smog [1],[2]. Catalytic oxidation is considered a simple and economical strategy for the removal of CH_4 and VOCs, and for this reason the development of highly active and thermally stable catalysts for their total oxidation is a research topic of high environmental interest [1], [2]. In present work, $La_{1-x}Sr_xMnO_3$ perovskites were studied under the total catalytic oxidation of hydrocarbons, CH_4, C_3H_8 and C_3H_6. Specifically, the effect of the gradual partial replacement of La by Sr was investigated (for x = 0, 0.3, 0.5 and 0.7) under O_2 excess conditions, and under different pre-treatment protocols: (a) pre-reduction, (b) pre-oxidation and (c) after oxidative aging at high temperatures. Moreover, various characterization techniques such as BET, XRD and H_2-TPR were implemented to correlate materials structure properties with their catalytic activity. LSM perovskites were found to exhibit good catalytic activity and thermal stability in the catalytic oxidation of light HCs. Furthermore, significant differences (volcano-type) of their catalytic activity (up to ~300°C in terms of T_{50}) were observed in relation to the composition of the perovskite as well as reverse hysteresis phenomena during heating/cooling cycles [2].

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