

Supporting information for the article

'Hot spot' hydrocarbon oxidation catalysed by doped perovskites – towards cleaner diesel power

J. Beckers, G. Rothenberg*

van 't Hoff Institute for Molecular Sciences, University of Amsterdam,
Nieuwe Achtergracht 166, 1018 WV Amsterdam, The Netherlands.

Fax. +31 20 525 5604.

E-mail: gadi@science.uva.nl

Experimental Section

Materials and instrumentation. GC analysis was performed at 55 °C on an Interscience Trace gas chromatograph equipped with Varian Porabond Q, molsieve 5A and alumina columns, enabling the analysis of CO, CO₂, O₂, water and light alkanes in 3.5 min. Selective MS analysis was performed using a Pfeiffer QMS 200 mass spectrometer (m/z range 0–200). All perovskites were prepared by combustion spray pyrolysis. **1–5** and **7–12** were prepared by Praxair Speciality Ceramics, Woodinville, USA. La_{0.7}Sr_{0.3}Co oxide **6** was kindly provided by Prof. Dr. K. Wiik, (NTNU Trondheim, Norway). Powder X-Ray diffraction showed traces of CeO₂ in La_{0.8}Ce_{0.2}Mn oxide and traces of unknown phases in (La_{0.85}Sr_{0.15})_{1.05}Cr oxide. Samples were heated by a 2.45 GHz, 1 kW Muegge multi-mode microware setup (see Figure S1). A detailed technical description of this setup was published elsewhere.^[1] All gases were purchased from Praxair and had a purity of 99.5% or higher.

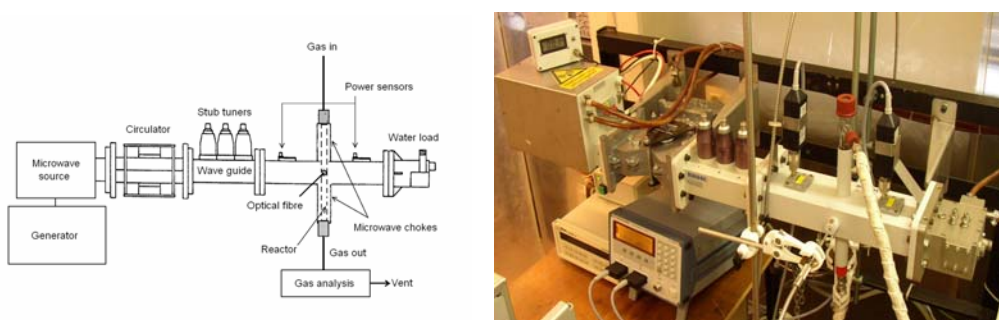


Figure S1. Schematic and photo of the 2.45 GHz microwave heating system consisting of: microwave source (Muegge), generator (Muegge MW-GIR 2M), circulator (Philips), stub tuners (Muegge), power sensor (Rhode & Schwarz), optical fibre (Luxtron Accufiber), microwave chokes, and water load.

¹ Y. Zhang-Steenwinkel, H. L. Castricum, J. Beckers, E. Eiser, A. Blik, *J. Catal.*, **2004**, 221, 523.

General procedure for propane and CO oxidation experiments. Each catalyst was first calcined for 6 h at 800 °C under 10 mlmin⁻¹ flow of air, with a heating ramp of 2 °Cmin⁻¹. Then, a 250 mg sample was mounted on quartz wool in a quartz tube reactor (i.d. = 4 mm), and subjected to a 1:1:10:88 v/v C₃H₈:CO:O₂:He continuous gas feed at 175 mLmin⁻¹. After 30 min, activity was assessed by GC (isotherm at 25 °C). The sample was heated to 150 °C at 5 °Cmin⁻¹ and activity was assessed again during a 25 min hold time. After the hold time at 150 °C, the sample was heated at 5 °Cmin⁻¹ in 50 °C steps to 500 °C, or to the maximum obtainable temperature with the given mw power (some of the catalysts could not heat to 500 °C). Activity was assessed at every temperature during a 25 min hold time. After the final hold the catalysed was allowed to cool back to 25 °C under helium.

Procedure for oxidation experiments in the presence of SO₂. The same procedure as above was followed, except that 200 ppm of SO₂ was added to the gas feed. This feed was led through the reactor for 1 h at 25 °C before the heating programme was started, and the final temperature was held overnight, after which the activity was assessed again. The percentage in activity drop (Table 1) was calculated by comparing this activity to the activity of the sample measured without SO₂ present in the gas feed, at the same temperature.