**Silver-modified perovskites as soot oxidation catalysts for Gasoline Particulate Filters**

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Introduction

European standards for Diesel cars restrict the particulate matter emissions by combining a limit number (PN: 6.0×10^11 particulates/km) with a limit mass (PM: 4.5 mg/km) as well as durability of after-treatment system. From 2014, PN and PM limits are also introduced for the approval of gasoline-fuelled vehicles. While conventional Port Fuel Injection (PFI) gasoline vehicles can easily comply with these limits, their Direct Injection (GDI) counterparts are found to emit systematically above this threshold by up to 1.5 orders of magnitude [1,2]. The Euro 6b legislations will tolerate a PN limit at 6.0×10^11 particulates/km for these GDI vehicles but this standard will be strengthened from 2017 (Euro 6c) to reach the level of Diesel cars. It is therefore expected that GDI vehicles may improve the utilization of noble metals. This study examines the use of Ag-modified manganites and ferrites as soot oxidation catalysts for GPF.

Materials and Methods

Two series of perovskites, La0.25Sr1-xAgxMnO3 and La0.25Sr1-xAgxFeO3 (with x=0.05, 0.1, 0.15, 0.2 and 0.25), were prepared by a complex route from the thermal decomposition of the chelated nitrate precursors, following by calcinations at 800°C for 4h under air flow. The obtained samples were named as xM or xF, according to the silver percentage introduced during the preparation and the chemical nature of the perovskites (M for manganites and F for ferrites). The chemical composition of the samples was measured by inductively coupled plasma-emission spectroscopy. BET specific surface area was estimated by nitrogen adsorption at liquid nitrogen temperature in a Micromeritics ASAP 2000 apparatus. The X-ray diffraction pattern of the materials was recorded at room temperature using X-ray power diffractometer Bruker D5005 with CuKα radiation. The microstructure and surface morphology were characterized by scanning electron microscopy (FEI ESEM-XL30). Surface properties of all samples were analysed by using O2-TPD and TPR. A model soot (Printex-U) and the respective catalyst powder (soot/catalyst weight ratio of 1:4) were mixed and crushed for 15 minutes in a mortar in order to improve the soot/catalyst agglomerate contact (tight contact).

Results and Discussion

Figure 1: Effect of Ag content of Mn-perovskites on T20 of soot oxidation and O2 desorption during TPD.

Significance

Modified Ag-manganites can provide a better stabilization and dispersion of the deposited silver species in comparison to the ferrite ones. These stabilized surface Ag oxides strongly improve the reducibility and the ability to release oxygen, and then the catalytic performances for soot oxidation of manganites, close to gasoline conditions.

References
