LUXFER
MEL TECHNOLOGIES

DATASHEET • 1034

Mixed Oxides for Automotive TWC Applications

Introduction

The field of Autocatalysis is very much legislation driven and this varies significantly dependent upon geographical location. This results in the need for advanced materials to meet the performance requirements, particularly after accelerated aging cycles.

Catalytic converters for gasoline vehicles simultaneously convert NOx, CO and Hydrocarbons in the exhaust (hence Three Way Catalysis, TWC). Luxfer MEL Technologies' Ceria Zirconia Mixed Oxides are a key component in this process as they act as an oxygen buffer to ensure optimal conditions for pollutant control.

We have developed customized formulations for Gasoline TWC, Gasoline Particulate Filters (GPF), Diesel Oxidation Catalysts (DOC) and Diesel Particulate Filters (DPF).

Key TWC material attributes

- Aging requirements
- Oxygen storage capacity
- Precious metal interaction

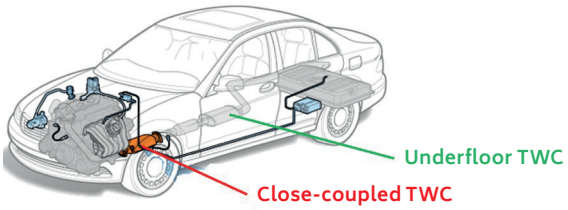


Figure 2.

Addition of Zirconia for increased thermal stability and enhanced ceria redox efficiency.

Minor rare earth dopants for further enhancement of thermal stability and OSC properties (O-vacancies, etc.)

→ La_2O_3 Nd_2O_3 Y_2O_3 Pr_6O_{11}

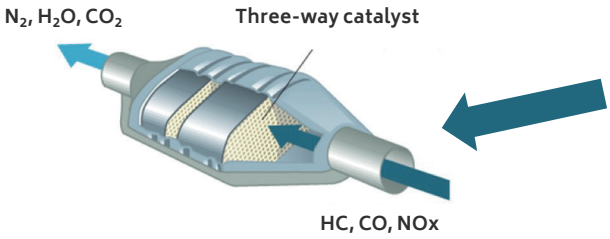


Figure 1.

CO (~1,000 ppm) from inefficient combustion

HC (~100 ppm) from incomplete combustion of fuel

NOx (~100 ppm) from reaction of N_2/O_2 at high temperature

Typical Luxfer MEL Technologies' mixed oxide properties

Table 1.

Material	Fresh		950˚C/2 hour (Air)		1,000˚C/4 hour (Air)		1,100˚C/12 hour (HT)	
	SA (m^2/g)	TPV (m^3/g)	SA (m^2/g)	TPV (m^3/g)	SA (m^2/g)	TPV (m^3/g)	SA (m^2/g)	TPV (m^3/g)
30% CeO_2 (A)	106	0.36	65	0.32	49	0.27	19	0.12
40% CeO_2 (B)	99	0.41	52	0.32	42	0.29	22	0.12
45% CeO_2	73	0.36	47	0.28	36	0.22	15	0.07

*HT = Hydrothermal aging (10% H_2O in air)
**All materials contain additional rare-earth oxides (5–10%).

1,000˚C/4 hour air aged

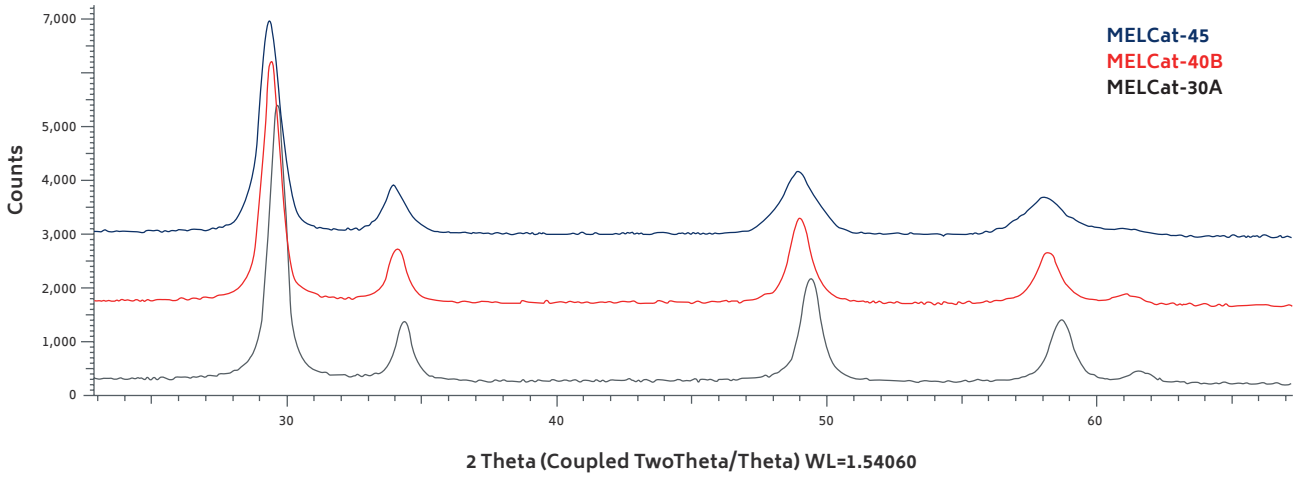


Figure 3. XRD – 1,000˚C/4 hour air aged

Bare oxide (air aged 1,000˚C/4hr)

- OSC testing by O_2 pulse
- $T_{reaction}$ shown (˚C)
- Sample initially pre-reduced (600˚C)

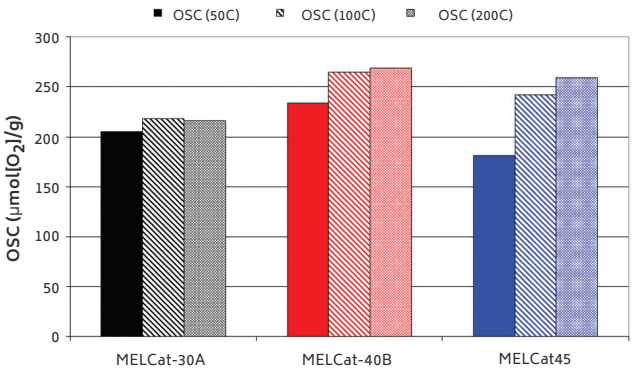


Figure 4. OSC by O_2-puse (bare oxide, aged 1,000˚C/4 hour)

Luxfer MEL Technologies' advantages

- Global supply is done from our manufacturing plants in Flemington, NJ, USA and Manchester, UK.
- In addition to a wide range of hydroxides and oxides, Luxfer MEL Technologies also produces many zirconium based solutions often used as binders, adhesion promoters and sources of zirconium for catalysis.
- Luxfer MEL Technologies is committed to developing materials that offer a specific benefit in these individual applications, but with sufficient robustness that we can tailor them to suit the end user.

Discover more at

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