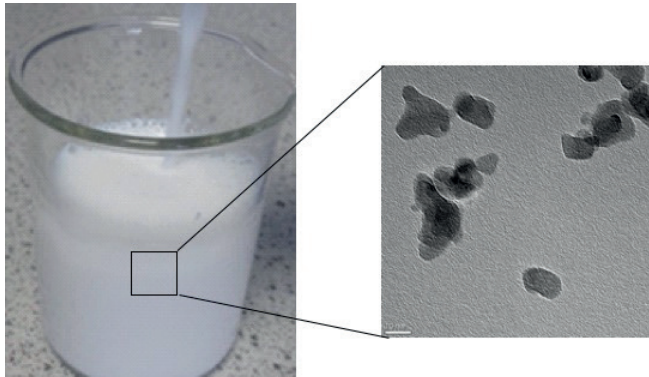




Nano Dispersions for Advanced Applications

Luxfer nano dispersions – general properties

- Aqueous dispersion of mixed oxide
- 20-25 wt.% oxide (*current standard**)
- pH 3-8, composition dependant
- Contain no organic additives, or stabilizers
- Nanometer size particles
- Low viscosity; <100cps, dependent on composition
- Long-term stability; >1year



Nano dispersions for automotive catalysis – filter applications

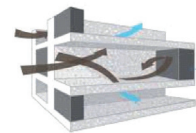
- Diesel particulate filters (DPF's) have been a standard component in the exhaust after treatment for many years for passenger cars, trucks and buses globally.
- The filter is regenerated either passively (NO_2 oxidation) or actively (fuel injection). Catalytic materials are coated onto the filter to lower the temperature of soot oxidation and to promote NO_2 formation.
- Gasoline particulate filters (GPF) are a more recent development. Although low in mass, GDI (Gasoline Direct Injection) engines emit a large number of very small (hazardous) soot particles.
- Any coating can lead to an increase in back pressure (reduced fuel economy & peak power, etc.).



Cordierite Filter (DPF)



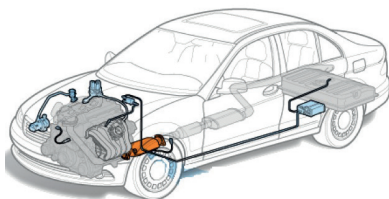
Silicon Carbide Filter (DPF)



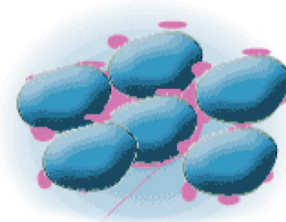
Wall-flow filtration mechanism

Luxfer nano dispersions – potential applications

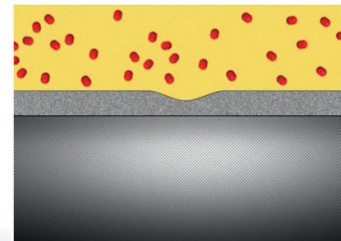
Emission control



Binder



Coating



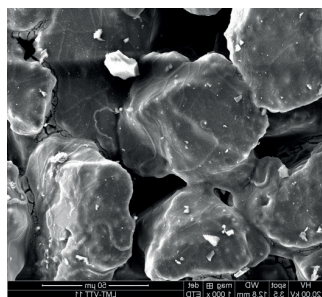
Support materials for filters

- Suitable materials for filter coating should provide the necessary catalytic performance/filtration efficiency whilst maintaining an acceptable back pressure within the exhaust system.

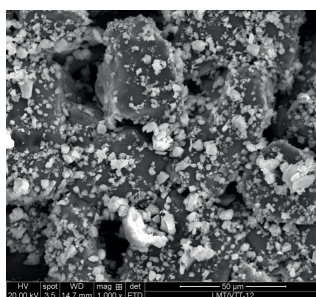
- Particle size is a key aspect for these materials:

Smaller particle size → Deeper penetration of filter walls → Potential back pressure benefit

Materials for DPF	Fresh (550 °C)		900 °C/2 h (Air)	
	SA (m ² /g)	TPV (m ³ /g)	SA (m ² /g)	TPV (m ³ /g)
CePrZrOx (nano)	114	0.16	48	0.13
CePrZrOx (milled oxide)	84	0.24	54	0.21



CePrZrOx (nano) on SiC filter



CePrZrOx (milled oxide) on SiC filter

- Nano dispersion shows similar surface area stability to milled oxide, with a more homogenous coating.
- TWC/OSC compositions are also available for GPF applications.
 - CeZrOx mixed oxides containing additional dopants (e.g. La₂O₃, Nd₂O₃, Y₂O₃, Pr₆O₁₁)

Conclusions

- Nano-dispersions contain nanometer-sized zirconium-based oxide particles in a purely aqueous and completely inorganic system.
- They are particularly suited to coated filter applications (e.g. DPF and GPF) providing catalytic activity with a low back pressure penalty and good adhesion.
- Other applications include functional binders, coatings and anything requiring a combination of small particle size and specific function.

Discover more at

www.luxfermeltechnologies.com

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[†] The information contained within is meant as a guideline only

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