



Water-Gas-Shift Catalysts

A major technical problem in the commercialisation of PEM fuel cells in automobiles is the need for a fuel processing system, in the absence of hydrogen as a fuel source, to convert gasoline into a hydrogen-rich gas. The fuel processor must deliver a gas stream with very low levels of carbon monoxide - a poison for the platinum electrocatalysts used in PEM fuel cells. The fuel processor must therefore contain a water-gas shift reactor, which reduces the CO concentration to intermediate levels, prior to the final CO clean-up step. Existing WGS reactors are based on copper catalysts which have a number of practical problems associated with them.

There have been some reports on the use of Pt/ceria catalysts as well as Pt/ceria-zirconia systems (see www.nextechmaterials.com for a summary).

ME (MEL Chemicals/MEI/Nikkei-MEL) is the world's leading manufacturer of ceria-zirconias and can offer

powders and sols for use as raw materials for Water-Gas-Shift Catalysts.

Zirconium oxides/hydroxides in their undoped or doped forms can be tailored to modify the nature of catalyst supports with respect to surface area stability, porosity, surface acidity/basicity as well as crystallinity. ME can offer a range of ceria doped materials.

PRODUCT DATA

It is standard procedure to supply the doped and undoped hydroxides as dried, free flowing powders rather than oxides. Oxides calcined at a specific temperature can be supplied on request. Calcination of these hydroxides at the stated temperature gives the properties indicated in the tables.

Other properties were measured after calcining at the temperature noted in the table.

All dopants are given as weight %.

CERIUM DOPED ZIRCONIUM HYDROXIDES

PRODUCT CODE - 802

CeO₂/MO_x : 17.5%

Typical LOI : 25-35%

Typical Impurities (on MO_x content)

Na	0.01%
Cl	<0.01%
SiO ₂	0.05%
SO ₃	<0.10%
TiO ₂	0.10%

PARTICLE SIZE

d50 1μm

SURFACE AREA (m²/g)

Temp.(°C)
500/2hr 100

POROSITY

Pore Volume (cm³/g)
Temp.(°C)
500/2hr 0.17

PRODUCT CODE - 892/02

CeO₂/MO_x : 17.5%

La₂O₃/MO_x : 5.0%

Typical LOI : 25-35%

Typical Impurities (on MO_x content)

Na	0.01%
Cl	<0.01%
SiO ₂	0.05%
SO ₃	<0.10%
TiO ₂	0.10%

PARTICLE SIZE

d50 1μm

SURFACE AREA (m²/g)

Temp.(°C)
500/2hr 120

POROSITY

Pore Volume (cm³/g)
Temp.(°C)
500 / 2hr 0.25

PRODUCT CODE - 1289/01

CeO₂/MO_x : 17.5%

Typical LOI range : 15-25%

Typical Impurities (on MO_x content)

Na	0.01%
Cl	<0.01%
SiO ₂	<0.01%
SO ₃	<0.02%
TiO ₂	<0.01%

PARTICLE SIZE

d50 20µm

SURFACE AREA (m²/g)

Temp.(°C)
500/2hr 100

POROSITY

Pore Volume (cm³/g)
Temp.(°C)
500/2hr 0.35

PRODUCT CODE - 1291/01

CeO₂/MO_x : 17.5%

La₂O₃/MO_x : 5.0%

Typical LOI range : 15-25%

Typical Impurities (on MO_x content)

Na	0.01%
Cl	<0.01%
SiO ₂	<0.01%
SO ₃	<0.02%
TiO ₂	<0.01%

PARTICLE SIZE

d50 20µm

SURFACE AREA (m²/g)

Temp.(°C)
500/2hr 120

POROSITY

Pore Volume (cm³/g)
Temp.(°C)
500/2hr 0.55

ZIRCONIA SOLS

MEL CHEMICALS, MEI and NIKKEI-MEL offer a range of zirconia sols and related materials.

For example:

ZIRCONIA SOL (SCP 156)

ZrO₂ content 30%,
Stabiliser nitric acid.

SCP203/01

ZrO₂ content 30%,
Stabiliser acetic acid.

As well as these Sols, ME is developing a range of colloidal zirconias with the following typical properties:

COMPOSITION

Aqueous dispersion of particles <1µm ZrO₂ doped with CeO₂ + other rare earths (compositionally variable)

TYPICAL PROPERTIES

SOLIDS CONTENTS ~15 wt%
oxide in slurry

SLURRY pH ~5.0

ME will be pleased to discuss specific requirements in more detail, please contact:-

Dr Gary Monks

Tel: +44 (0)161 911 1278

Fax: +44 (0)161 911 1090

E-mail: gary.monks@melchemicals.com



P.O. Box 6, Swinton,
Manchester M27 8LS ENGLAND.
Tel: 0161-911 1100.
Fax: 0161-911 1099.

<http://www.zrchem.com>



Magnesium Elektron Inc.,
500 Point Breeze Road,
Flemington, New Jersey 08822-9111.
Tel: 908 782 5800. Fax: 908 782 7768.

<http://www.zrchem.com>

Nikkei-MEL, 4025-1, Shimizu-Miho,
Shizuoka City, Shizuoka Prefecture,
424-0901, JAPAN.
Tel: (0) 543 364333. Fax: (0) 543 364370.

<http://www.zrchem.com>