

Zirconia-based materials for catalytic conversions

Our capability

Luxfer MEL Technologies supplies both doped and undoped zirconium compounds (hydroxides and oxides) for use in a wide range of catalytic applications. Materials are solid powders, with tunable properties resulting from our proprietary manufacturing processes. These are carried out at multi-ton scale.

LMT also supplies zirconium solutions that are frequently used as binders (or indeed a Zr-source) in catalyst forming.

Advantages

Easy separation from reaction media

- Catalysts can be easily separated from the reaction media

High activity / low temperature operation

- Good interaction with supported metals, and properties can be modified by dopants

Structure

- They have developed (tunable) porosity and defined crystalline structure

Stability

- Particularly under hydrothermal (aqueous) conditions, ideal for 'green' processes

Reusability

- Catalysts can be used several times during reaction cycle

Environmentally friendly

- Zirconia-based materials do not release any halogen containing or other compounds which might corrode equipment, impact eco-system

Typical dopants

Table 1.

Dopant	Property
Undoped	Amphoteric
SO ₄ , WO ₃	Strong acidity
SiO ₂ , Al ₂ O ₃	Mild acidity
MgO, La ₂ O ₃	Basic
CeO ₂	Redox

*Other dopants can potentially be worked with, e.g. transition metal oxides, other rare-earth oxides, SnO₂, Nb₂O₅, PO₄.

Multiple dopants/combinations are also manufactured on a regular basis.

Physical properties

Table 2.

	Synthetic route			
	C1	C3	C4	New
D ₅₀ (µm)	~1 (A) ~25 (B)	~5	~25 (broad)	~20 (broad)
Porosity	Low	Med	High	v.High
Surface Area	Med	Med	High	v.High
Active Sites	Med	Med	High	v.High

*Active sites may refer to acidity for example

Applications

Typically has involved isomerisation of alkanes in gasoline upgrading (super-acid).

However, zirconia-based supports have attracted a lot of interest for "green" processes, for example cellulose conversion¹⁴. Other examples are shown on the next page.

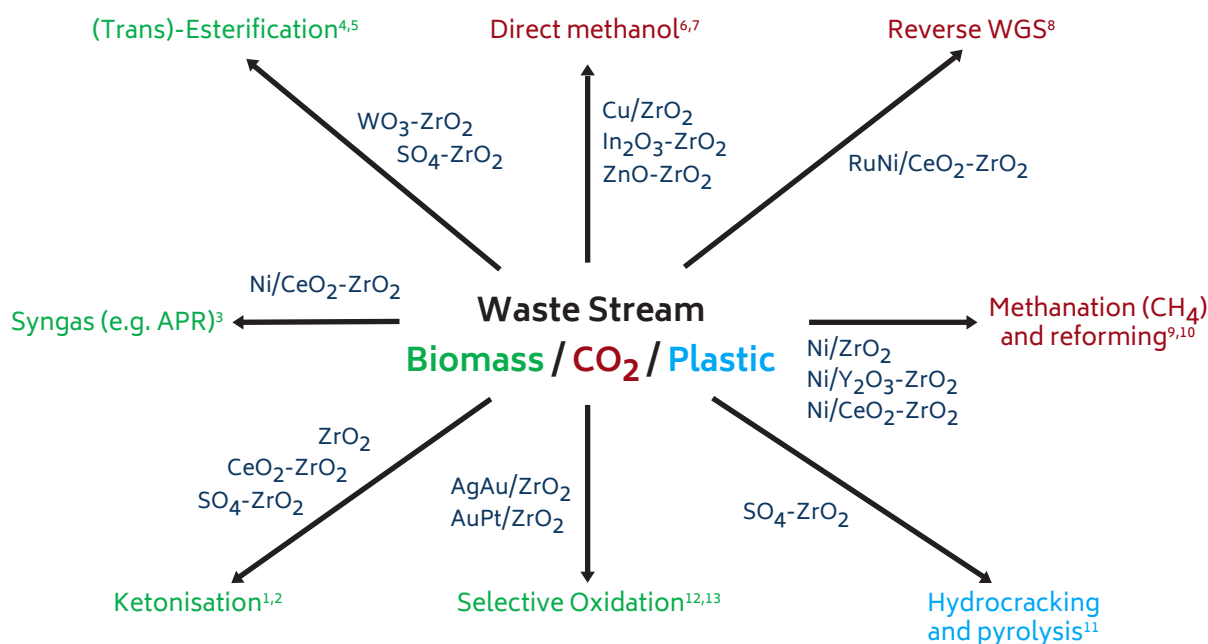


Figure 1.

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