

Metal Organic

Chemical Vapor Deposition

DESCRIPTION

This system processes a single horizontally oriented wafer (100 mm) placed on a heated substrate holder inside cylindrical stainless steel reactor (wall temperature is kept at a lower value). Essential part is the showerhead through which the system delivers process gasses and precursor vapors at reduced pressure. Metal-organic precursors decompose at the wafer surface, leaving the metal component to form the required layer, while the gaseous organic products escape.

PRECURSORS

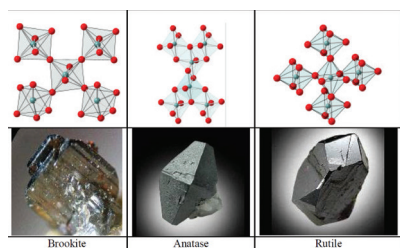
for selected metals precursors are available in various configurations, solid or liquid forms and different levels of toxicity

- Bis(cyclopentadienyl)**zirconium** dichloride [Zirconocene dichloride] white powder, **respiratory, eye or skin irritation**
- Bis(tetramethyl-heptanedionato)barium hydrate [Ba(TMHD)2] white odourless powder, melting at 200°C, **poison**
- **Iron(III)** acetylacetonate, melting at 183 °C, **skin irritation**
- **Titanium(IV)** iso-propoxide, light yellow liquid, boiling at 58 °C, **highly flammable, toxic**

PRODUCTS

Titanium Dioxide TiO₂

UV protection films, sensors, biomedicine; inorganic **nanotubes** and **nanoribbons** can be produced from anatase phase by hydrothermal synthesis or anodization.



Iron(III) oxide Fe₂O₃

the most common ferromagnetic particle used in all types of magnetic storage and recording media small particles (<10 nm) of gamma phase (cubic) are superparamagnetic

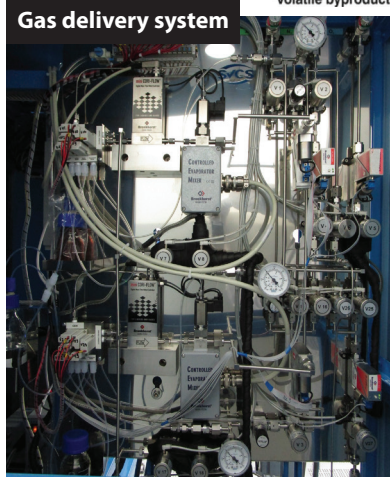
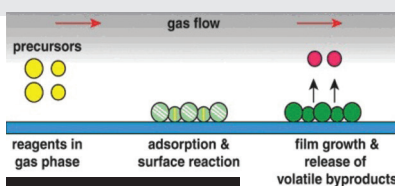
Hafnium dioxide HfO₂

optical coatings, **high-k dielectric** in MOS devices

MORE INFO

Guarantor: Filip Münz (filip.munz@ceitec.vutbr.cz)

Web: <http://nano.ceitec.cz/metal-organic-chemical-vapor-deposition-mocvd-mocvd/>



Barium Titanate BaTiO₃

capable of the **photorefractive effect**: nonlinear optical effect seen in certain crystals and other materials that respond to light by altering their refractive index. The effect can be used to store temporary, erasable holograms and is useful for *holographic data storage*. It can also be used to create a phase-conjugate mirror or an optical spatial soliton.

Lead zirconate titanate Pb[Zr_xTi_{1-x}]O₃

piezoelectric material like PZT develops a voltage (or potential difference) across two of its faces when compressed (useful for sensor applications), or physically changes shape when an external electric field is applied (useful for actuator applications).

- pyroelectric
- ferroelectric (spontaneous electric dipole)



SPECIFICATION

Temperature control

from room temp. up to 800 °C, precision 1 °C

Precursor control

3 gas lines with mass flow controllers

carrier gasses (N₂, Ar) + process gas (O₂)

3 liquid precursor delivery lines with indep. control of carrier gas flow

2 thermally controlled evaporators (CEM) + bubbler (10-50 °C with precision 0.2 °C)

Uniformity of the deposition

nonhomogeneity < 3%

improved by holder rotation (up to 200 rpm)

