

## Surface Modifiers for Improved Properties and Metal Oxide Formation

Dorf Ketal is the industry pioneer and a global leader in producing and supplying organic titanates and zirconates. For more than 50 years, Dorf Ketal has been delivering innovative, high-quality Tyzor® compounds to meet the evolving needs of a wide range of industrial markets. Dorf Ketal offers more than 40 grades of Tyzor®, including several specialty compounds.

### Diverse Applications

Dorf Ketal Tyzor® organic titanates and zirconates can act as a source for titanium or zirconium dioxide or for mixed metal oxides. The Tyzor® products can be used to modify surfaces by forming a polymeric inorganic functional film. Some typical examples of these diverse applications include:

- Formation of TiO<sub>2</sub> or ZrO<sub>2</sub> pigments (macro-sized and nano-sized)
  - decomposition of organic soil (e.g., self-cleaning)
  - improved properties of coatings (e.g., scratch resistance, cleanability)
  - precursor for ceramic
- Inorganic binder for castings
  - binder for metal casting molds (e.g., titanium)
- Protective coatings
  - corrosion protection of metals
  - improved scratch resistance of plastic, metal, glass
- Support for inorganic functional metal oxides
  - carrier of inorganic metal oxide network with catalytic effects (e.g., for soil decomposition, DeNO<sub>x</sub> catalysis)
- Functional coating (e.g., for glass)
  - scratch protection
  - adhesion promotion
  - iridization (pearlescent effects)
  - easy to clean properties of architectural glass

### Multitude of Benefits

The effects and benefits of Dorf Ketal Tyzor® organic titanates and zirconates depend on the application and end use. Typical improvements/advantages include:

| Application/End Use                         | Improvement/Advantage  |
|---|--|
| Formation of Pigments                       | pure raw materials   |
|   | easy to handle   |
|   | no formation of aggressive by-products (such as HCl with TiCl <sub>4</sub> )       |
|   | usable in hydrolytic and pyrolytic processes                                       |
| Inorganic Binder                            | catalyst for condensation reaction of other metal oxides                           |
|   | compatible in condensation with other metal alkoxides (Si, Al, etc.)               |
|   | TiO <sub>2</sub> , ZrO <sub>2</sub> are essentially non-toxic                      |
|   | alternative to silicate binder (for special metal casting)                         |
|   | enhancement of mechanical strength of mixed metal coatings                         |
| Functional Binder                           | adhesion promotion   |
|   | adjustment of end product properties by combination with different metal alkoxides |
| Protective Coating (for glass, metal, etc.) | application via spray, dip, wipe, vaporization, etc.                               |
|   | low toxicity (vs. chrome, tin, antimony)   |

### Broad Product Selection

A broad range of Tyzor® organic titanates and zirconates is available for use in solvent-based or water-based systems. The Tyzor® product line includes reactive alkoxides and stable chelates of titanium or zirconium.

Selection of the correct Tyzor® product depends on the system and end use. In general, the more reactive alkoxides are the preferred products in these applications. The chelates have a reduced reactivity and allow for improved stability compared to metal alkoxide formulations.

### Unique Mode of Action

Tyzor® titanates and zirconates can be transformed to metal oxides by hydrolytic or pyrolytic processes.

### Hydrolysis

Titanates and zirconates can be used to form titanium dioxide or zirconium dioxide via hydrolysis. These can be used either as pigment or as continuous inorganic film.

By hydrolysis and condensation steps (sol-gel process) of titanates and zirconates in the presence of other metal alkoxides (Si, Al, etc.) or organofunctional silanes, polymeric inorganic networks with specific functions can be formed.



# Dorf Ketal Tyzor®

## ORGANIC TITANATES AND ZIRCONATES

### Pyrolysis

At higher temperatures (>350°C) the titanates and zirconates decompose to form the corresponding dioxide as pigments or a polymeric inorganic film.

### Put Tyzor® to Work for You

The broad range of Tyzor® organic titanates and zirconates allows you to select the optimum grade to meet your specific needs, enabling you to produce superior quality products for a wide variety of applications and market segments.

And, with warehouses in every region and an integrated global network of highly trained sales and technical service professionals available to assist you, it is easy and convenient to put Tyzor® to work in your application anywhere in the world.