INTRODUCTION

Tyzor® organic titanates and zirconates are highly reactive compounds with dozens of applications on metal surfaces. They are non-toxic, effective at low dosages and easy to apply and control.

Tyzor® Applications

- Corrosion coatings and rinses
- Anti-wear coatings
- Thin, high-strength wire coatings
- Metal surface hardness improvers
- Dielectric coatings for electronics
- Mold binders for metal castings

Dorf Ketal Tyzor® organic titanates and zirconates modify surfaces by forming polymeric inorganic functional films. Coatings containing Tyzor® organometallics protect metal from oxidation and chemical attack and increase wear resistance. Tyzor® organometallics improve adhesion of paints and sealants on metal surfaces, and they improve coating longevity, appearance and performance.

Dorf Ketal is the world’s leading manufacturer of organic titanates and zirconates. We offer more than 40 Tyzor® organometallic grades, including formulations with reactivity and performance tailored for virtually any application.

Tyzor® Functions

- Interlayer adhesion
- Chemical/solvent resistance
- Water resistance
- Heat resistance
- Improved mechanical properties
- Surface hardness
- Corrosion resistance
- Enhanced processing properties
- Improved electrical properties

Adhesion Promoters

Effect:
Highly reactive Tyzor® titanates and zirconates dramatically improve adhesion on a wide range of metal and other surfaces, including reactive and unreactive inorganic materials and even organic polymers. Coating integrity and longevity are improved, along with resistance to chemicals and alkalis, as well as electrical properties.

FIGURE 1: Mechanism of Adhesion Promotion

Figure 1: High reactivity allows Tyzor® titanates and zirconates to form bridges between inorganic and organic substrates. These bridges serve as functional binders that dramatically improve adhesion and resistance to moisture and chemical aging.

Use:
Tyzor® products are often applied to metals as primer solutions and they also can be used as polymer additives in metal coatings.

Surface Protection

Effect:
Various Tyzor® titanates or zirconates can be used to modify surfaces by forming stable protective metal oxide layers on metallic and other substrates. These protective oxide layers can act as binders or coatings to improve properties such as corrosion resistance, chemical resistance and scratch resistance while improving adhesion.

Use:
Substrates can be primed with titanate/zirconate solution applied by controlled hydrolysis and heat or by vapor deposition.
Corrosion Protection

**Effect:**
Tyzor® titanates and zirconates alone and in combinations with other organo-metal binders can be used to coat small metal parts, such as screws, springs, clamps and fasteners as well as metal coils or sheet metal. They also can be used to bind metal pigments such as zinc or aluminum that act as sacrificial agents, providing improved corrosion protection.

**Use:**
Solvent- or water-based titanate solutions can be applied using dipping or spraying techniques.

Pre-treatment for Phosphatization

**Effect:**
Tyzor® titanates are used in combination with phosphates and optional silicates to clean and activate metal surfaces prior to phosphatizing steel, zinc, aluminum, cadmium, zirconium and manganese. The result is a finer crystalline surface structure that improves coating adhesion and resistance to corrosion.

**Use:**
The titanate treatment can be applied to the metal at 25 - 70 °C (77 - 158 °F) and baked or evaporated dry prior to phosphatizing the treated metal surface.

Corrosion-Resistant Rinses

**Effect:**
Tyzor® titanates are excellent, non-toxic alternatives to the toxic chromium solutions often used as rinses for corrosion resistance after phosphatization. Tyzor® titanates can be used to treat phosphated metal surfaces in this way, resulting in excellent corrosion resistance compared to a chromium control.

**Use:**
Phosphatized metal surfaces are treated with an aqueous solution of a water-soluble organic titanium chelate to form a water-insoluble deposit on the phosphated metal surface. The titanate solution can be applied by various techniques such as spraying, brushing, dipping, roller-coating or flow-coating and can be dried at ambient temperatures, by hot air or by baking.

Organic Coating Additive

**Effect:**
Tyzor® titanates and zirconates catalyze polyurethanes, epoxy system components and related compounds used in coating formulations for metal surfaces. They also are used as binders and as cross-linkers for other binders in paints, as well as adhesion promoters.

**Use:**
Tyzor® products are typically formulated with other ingredients in catalysis and crosslinking. They also may be applied as primers from dilute solution for adhesion-promotion or surface-modification applications.

Surface Hardner

**Effect:**
Metals can be treated with Tyzor® titanates to increase surface hardness.

**Use:**
Tyzor titanates may be applied as primers from dilute solution for surface-modification applications.

Total or partial hydrolysis in sol-gel applications, typically in combination with other metal alkoxides, may also be used to produce metal oxide systems for surface hardness improvement.

Wire Enamels

**Effect:**
Tyzor® products are used as crosslinkers and adhesion promoters to produce thin, flexible coatings for electrical wire insulation based on polyester, polyester amide and polyester imide. They accelerate curing, improve resistance to heat and abrasion and enhance adhesion and insulation properties.

**Use:**
Tyzor® titanates are typically applied as additives in coatings formulations.
AUTOMOTIVE CORROSION PROTECTION CASE STUDY
– ANTI-CORROSION COATING FOR FASTENERS

• Customer Description
  – Automotive corrosion coatings manufacturer

• Parts Manufactured
  – Nuts, bolts and other fasteners

• OEM’s Served
  – Most major global OEMs

• Tyzor® Products Used
  – AA-75, TnBT, TOT, BTP and EHTAA

• Application Process
  – Dip and spin followed by air drying on a conveyor

• Benefits
  — Excellent film-thickness control adds minimal weight
  — Superior corrosion protection
  — Ideal film viscosity for consistent coverage
    of edges, cracks and crannies
  — Stability in the bath provides consistent rheology
    and drying times
  — Outstanding durability without added torque
    when fasteners are tightened, removed and re-tightened.
  — Dries quickly to form a hard, non-tacky surface
    that allows parts to be handled without sticking together
    or damaging the coating, improving productivity
  — Conforms to all applicable OEM specifications
    and specified ASTM testing methods.

INDUSTRIAL ORGANIC COATING ADDITIVE CASE STUDY
– CHAIN EXTENDER FOR LIGHT-STABLE POLYUREA SPRAY TRUCK BED LINERS

• Customer Description
  – Industrial manufacturer

• Parts Manufactured
  – Truck bed liners

• Product Used
  – Clearlink® 1000 Aliphatic Amine Chain Extender

• Application Process
  – Sprayed polyurea coating

• Benefits
  — Low reactivity provides considerable latitude for cure-rate control
  — Does not alter formulation color
  — Compatible with a wide range of polyols, co-curatives and
    other polyurethane and polyurea chemicals
  — Extended pot life allows coating to flow, adhere and
    develop a smooth finish
  — Produces tough coatings that are extremely light-stable
    in harsh environments

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