



**Dorf Ketal Tyzor®**

**ORGANIC TITANATES AND ZIRCONATES**

## **For Increased Productivity of Oil and Gas Wells**

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.

### **Ideal for Oil and Gas Field Applications**

Dorf Ketal Tyzor® organic zirconates and titanates are ideal as cross-linking agents in stimulation fluids to improve the recovery of oil and gas from production wells.

The unique properties of Tyzor® help to enhance oil and gas well productivity in a number of applications, including: hydraulic fracturing, drilling and enhanced oil recovery.

### **Broad Product Selection**

A broad range of Tyzor® zirconates and titanates are available for solvent, solvent-free and water-based applications.

The Tyzor® products most commonly used in oil and gas field applications are stable chelates of zirconium and, in some cases, titanium. Selection of the proper grade depends on the fluid formulation and the conditions of the well.

### **Unique Functionality**

Tyzor® zirconates and titanates act as cross-linking agents of functionalized polymers containing -OH and -COOH groups. This includes the guar and derivatized guar carbohydrate polymers traditionally used in hydraulic fracturing fluids, as well as newer synthetic polymers. The cross-linked polymer can function as a carrier of a proppant in hydraulic fracturing, or be used as a diverting agent in enhanced oil recovery.

Tyzor® zirconates and titanates can also be used as a cross-linking agent for fatty acids and metal oxides to form materials that act as fluid-loss additives in drilling fluids. Cross-linked surfactants can be used to stabilize these fluids against inorganic salt contamination.

For optimal down-hole performance, cross-linking rates can be fine-tuned by using Tyzor® DLA, an effective, general-purpose delay additive.

### **Diverse Applications**

Dorf Ketal™ Tyzor® zirconates and titanates can be used in a variety of oil and gas field applications, including: hydraulic fracturing fluids, drilling fluids and enhanced oil recovery.

### **Hydraulic fracturing fluids**

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Tyzor® organic zirconates and titanates cross-link functionalized polymers such as guar and its derivatives to create viscous gels that can be used to fracture subterranean formations and carry proppants into these fractures. Selection of the optimal Tyzor® cross-linking agent and usage conditions will depend on numerous factors, including: the polymer type and concentration; well temperature; brine type and strength; pH; breaker system; target viscosity; and desired cross-linking rate.

A variety of Tyzor® products is available to allow selection of an optimum cross-linking agent for the particular treatment conditions being employed. Products commonly used in hydraulic fracturing fluids include: Tyzor® 215, 217, 212, TEAZ, TE, CLA, LA and AA-75.

### Drilling fluids

Fluid-loss reduction agents for oil-based drilling fluids may be prepared by reacting Tyzor® titanates with a fatty acid, such as oleic or stearic acid, and a metal oxide. Drilling fluids can also be stabilized against inorganic salt contamination using an additive prepared from an anionic emulsifier, such as calcium dodecyl benzene sulfonate and a Tyzor® product.

### Enhanced Oil Recovery

Tyzor® organic zirconates and titanates can be used to create diverting zones in enhanced oil recovery operations. This includes formation of amorphous, gelatinous metal oxide plugs from hydrolysis of zirconium and titanium esters. Polymers, such as polyacrylamides, can also be cross-linked with Tyzor® zirconates and titanates to form the viscosified fluid needed to selectively block and control fluid flow through a subterranean formation.

Selection of the optimum Tyzor® cross-linking agent will depend on numerous factors, including: the polymer being used; pH; temperature; target viscosity; and cross-linking rate.

### 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.