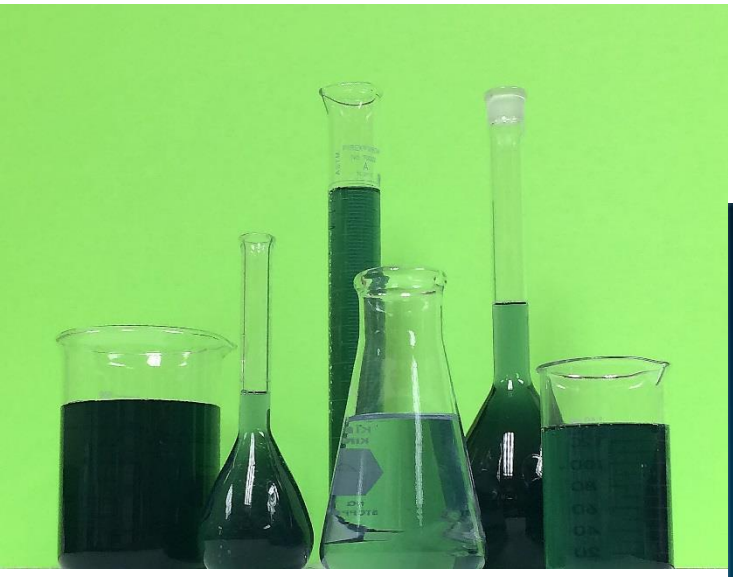
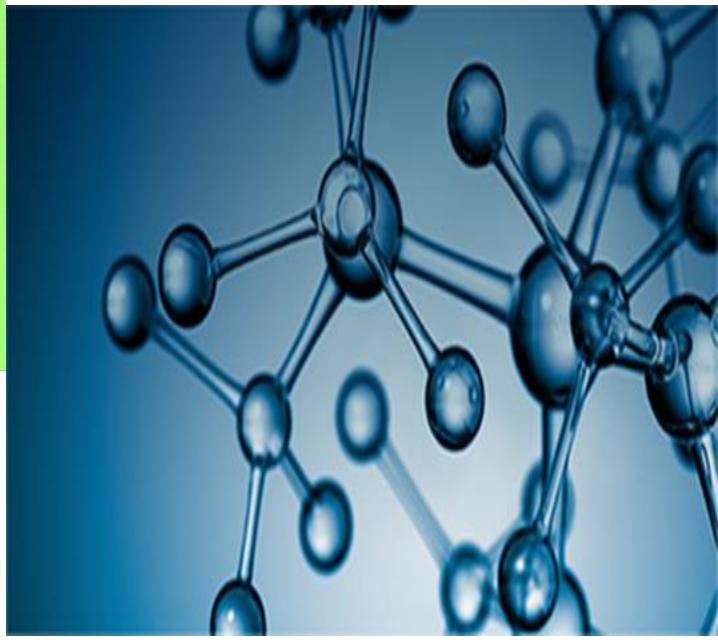
Innovative Chemical Technologies, Inc.

Organometallic Fatty Acid Complexes: How They Work





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Organometallic Fatty Acid Complexes

Overview

ICT Flexipel organometallic fatty acid products consist of a chemically reactive complex in which a C14-C18 fatty acid is coordinated with trivalent chromium. The product solutions are in isopropanol, and are water soluble.

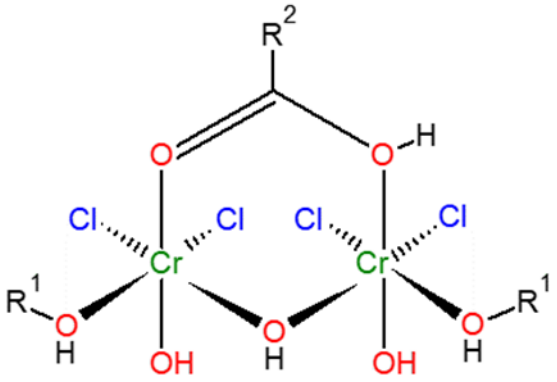
Flexipel organometallic fatty acid complexes are known to coordinate with polar groups (including hydroxyls, esters, and amides) on paper, leather, fabrics, nonwovens, polymers, and other negatively charged surfaces. This makes them particularly effective on natural or synthetic substrates.

When mixed into aqueous polymer systems such as starch, polyvinyl alcohol (PVA), and polyvinyl acetate, the chromium (III) reacts with active groups on the polymer chains, forming a polymer film upon drying. After curing, these Flexipel products form an insoluble layer of polymerized complex that is chemically bonded through chromium to available polar groups on the substrate surface. The organometallic hydrocarbon chains are oriented away from the surface.

Several Flexipel product options are available to meet specific end-use needs and their varying processing conditions.

Chemical Structure

Flexipel organometallic fatty acid complexes are complicated entities which have not been isolated from solution. The following representative chemical structures have been inferred.



R1 = i-Propyl
R2 = C14 - C18

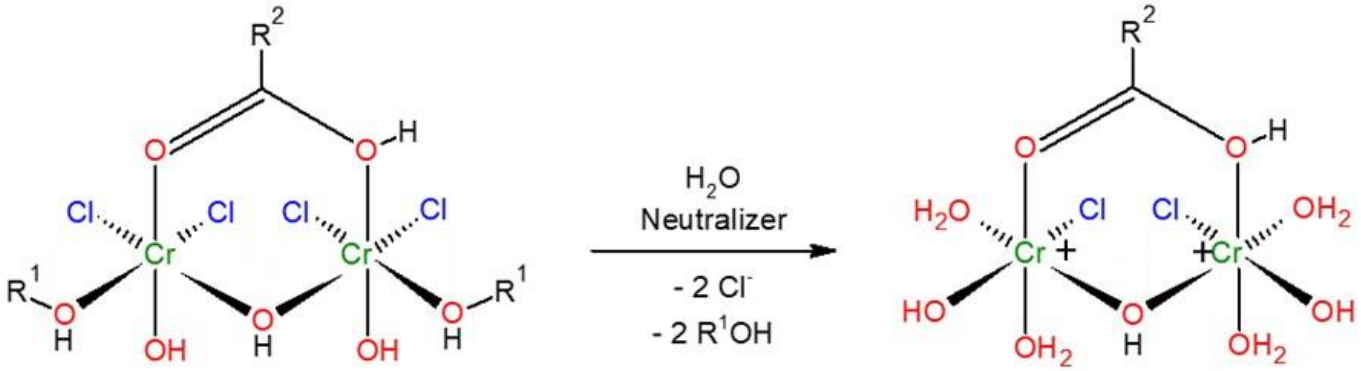
These chromium (III) complexes are six coordinate systems. Sites are occupied by multiple ligands in various combinations, which only allows a generic structure to be presented.
The ligands include fatty acid, chloride, hydroxyl, water, and IPA.

Organometallic Fatty Acid Complexes

Chemical Structure (continued)

When aqueous solutions are prepared with these Cr (III) complexes, H_2O groups displace the isopropanol ligand and some of the chloride ion. Formulation with a weak base accelerates hydrolysis of the complex.

Mechanistically, in subsequent steps, these hydrolyzed complexes form hydroxyl bridges between Cr (III) atoms.



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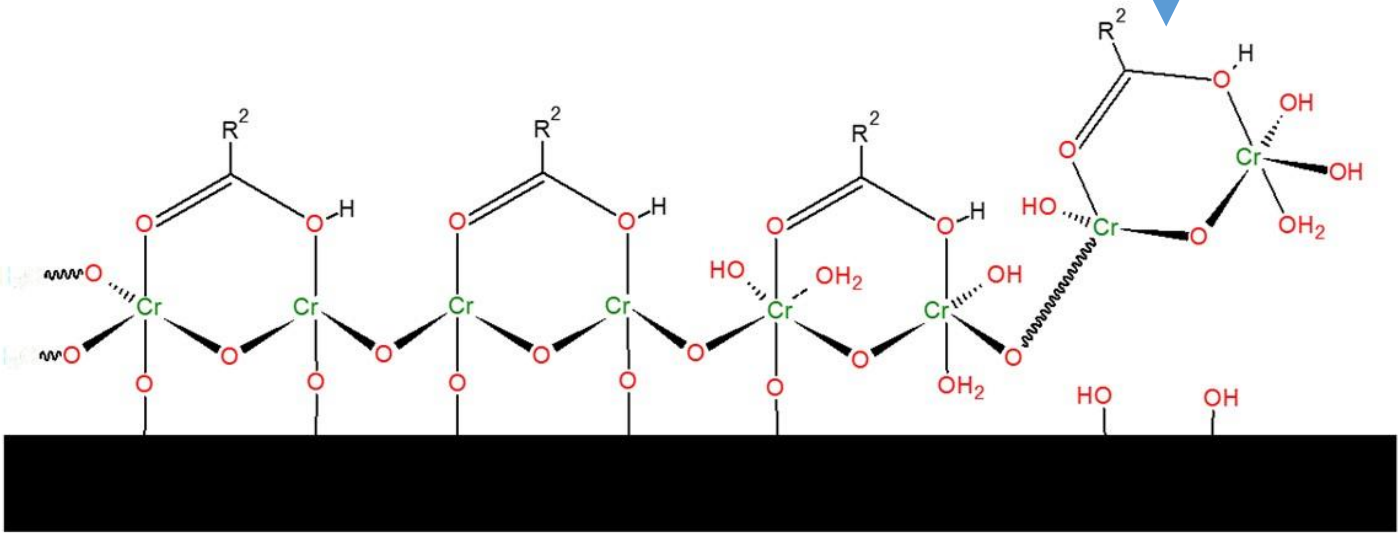

Organometallic Fatty Acid Complexes

Chemical Structure (continued)

With time and temperature, these complexes begin to network extensively (crosslink). As they lose a proton to the weak base, stable oxide bridges will form between the Cr (III) atoms and the substrate.

As these networks dry and cure, they become more permanently bonded to the substrate and to each other, which provides a durable surface treatment. This treatment will have a significant amount of hydrocarbon character due to the fatty acid chains seeking the air interface and thus making the substrate more water repellent.

Many surfaces such as paper, leather, textiles, and glass fibers contain polar groups (such as hydroxyls, esters, amides, carboxylates, sulfonic acids), and they are negatively charged. The high positive charge on the molecules of the Flexipel ion causes the chromium portion of the molecules to strongly bond with the negatively charged surface. The fatty acid groups orient outward, away from the substrate surface.

Properties

- Water repellency
- Release properties
- Increased chemical resistance
- Resistance to aqueous stains
- Wet strength of paper may increase slightly
- Does not affect substrate appearance
- Improved grease resistance, when used with aqueous polymer systems

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