

Cidetec / Top Achievement HARD CHROME ALTERNATIVES

REACH compliant coatings: Hard chrome alternatives



Functional hard chrome alternatives in line with legislation

CIDETEC has developed coatings that are an alternative to hard chrome, which in addition to complying with the properties of hardness, wear, friction and resistance to corrosion also comply with the applicable regulations to which the restriction of chromium VI refers.

Concept

Hard chrome plating has been one of the most commonly employed processes to obtain coatings with good properties with respect to their capacity to resist the most extreme conditions, while maintaining its quality, in very varied industries. An additional advantage is that it is a simple, versatile and cheap process. The main inconvenience is that due to the presence of hexavalent chromium in its formulation it is classed as carcinogenic by the International Agency for Research on Cancer (IARC) and regulated by REACH, which has forced us to find an alternative coating.

In order to respond to this need CIDETEC has developed multilayer coatings using electroless nickel, composite electroplating processes and coating usings nickel and tugnsten, which all show high resistance to wear and abrasion. They have anticorrosive and innocuous properties which enables their use as a real alternative to the current coatings made of hard chrome.

Our approach



REACH

REACH (Regulation on registration, evaluation, authorization and restriction of chemicals) was adopted by the European Union with the purpose of improving the protection of human health and the environment against the risks chemical products can pose, while at the same time it boosts the competitiveness of the chemical industry in the EU.



Electroless nickel multi-layers

Electroless nickel belongs to the group of processes based on chemical reduction of metal ions precursor. The coatings obtained contaings significant proportions of the active element present in this reducing agent, obtaining nickel-phosphorus (NiP) alloys in hypophosphite baths.

The alternative to hard chrome are those with a low P content electroless is the best alternative of nickel electroless coatings. However they have limited corrosion resistance. In order to increase the corrosion resistance of this type of coating, CIDETEC has developed a multi-layer process. The generated interfaces act by avoiding the propagation of cracks and defects along the thickness, improving the performance of the coating and maintaining the mechanical properties.

This is a very versatile technology as it also makes possible to combine layers of a different nature, allowing different functionalities to be combined in a single coating.

ELECTROLESS NICKEL

Ni electroless coating cryofracture.



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Composites

Composite coatings are obtained by including particles (usually polymeric, ceramic or oxides) in an electrolytically deposited metal matrix. These coatings synergistically combine the properties of the two materials to obtaining a coating with superior properties to each component.

CIDETEC has developed formulations based on nickel/silicon carbide (Ni/SiC), cobalt/chromium carbide (Co/CrC), nickel/ tungsten carbide (Ni/WC) and nickel/alumina (Ni/Al2O3) composites, all with excellent wear and abrasion resistance.

COMPOSITE COATINGS ON AERONAUTIC GEARS



ALUMINA PARTICLES INTEGRATED IN THE COATING



SEM image in section of composite coating of metal matrix.

Nickel-tungsten coatings

CIDETEC has developed NiW formulation that has excellent hardness properties and corrosion resistance, even at high temperatures, as well as an electroplating process adapted to its characteristics.

NIW ADVANTAGES

Property	Hard chromium	NiW	
Pre-treatment	In the hard chrome bath, this process can generate problems with high-alloy steels	Degreasing and stripping line. By controlling the process parameters it is possible to treat high alloy steels	
Efficiency	20-25 %	45-50 %	
Thickness	Between 25 and 100 µm. For pieces that require a thickness between 80-300 µ	Good property results with a thickness of 25-30 µm. Allows later correction using a higher thickness (tested approx. 100 µm)	
Hardness	800 - 1000 Hv	1100 Hv with heat treat-ment at 400 °C for 1 hour	
Uniformity of deposit	Accumulation in zones of high current density	Good uniformity	
Adherence	Easily propagation of cracks. Poor on sharp edges	Good on all surfaces of the piece. Tested on steel (type F1 and F124)	
Abrasion/wear at 10 000 cycles	Good. Taber Index: 3.8	Slightly superior to hard chromium. Taber Index: 5.4	
Corrosion resistance	Resistance inferior to 200 h neutral salt spray for coatings of 25-30 µm	Excellent. More than 400 h in neutral salt spray for coatings of 25-30 µm	

Opportunities



AUTOMOBILE

INDUSTRY

CHEMICAL AND PETRO-CHEMICAL INDUSTRY



AEROSPACE

MOULDS AND MATRIXES MINING

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