ALUMINUM
Project Fact Sheet

Novel Technique For Increasing Corrosion Resistance

Nontoxic coating process protects aluminum and its alloys from corrosion

Benefits

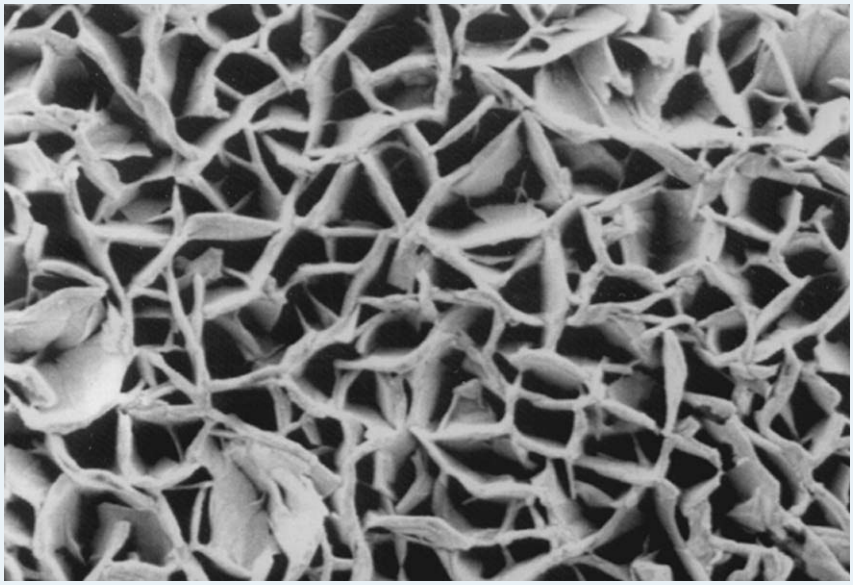
- Saves energy through longer wear
- Hydrotalcite coatings improve corrosion resistance and paint adhesion of aluminum and aluminum alloys
- Easily applied by standard dip or spray processes
- More environmentally safe materials and process
- Avoids concerns and associated waste treatment challenges of poisonous and carcinogenic materials conventionally used to make chromate coatings
- Costs less than chromate coating and much less than anodization
- Excellent corrosion protection for aluminum alloys used for most purposes

Applications

The hydrotalcite coating process can be used to protect any aluminum product. It has demonstrated corrosion protection comparable to chromate coatings for a wide range of non-copper or low-level copper aluminum alloys (including the 3000-, 5000-, and 6000-series). These alloys are commonly used for architectural aluminum, such as siding and stair railings, truck bodies, aluminum cans, and other general applications. The hydrotalcite process is also ideal for aircraft or other maintenance operations.

Aluminum and its alloys are used in a wide range of products that we see every day, from beverage containers to siding for buildings, from trucks to aircraft. To create long-wearing aluminum products, the metal is usually pretreated or coated for adequate corrosion protection. The standard pretreatment for aluminum is chromate coating. However, the oxidizing solutions used to create chromate coatings, as well as final coatings themselves, contain hexavalent chromium (Cr^{6+}), a known carcinogen. In addition to hexavalent chromium, cyanide and other toxic substances are also used in most methods for chromate coating. These toxins are so powerful that the European Union is currently considering an outright ban on consumer products coated with chromates by 2002. In addition, the Occupational Safety and Health Agency and the United States Environmental Protection Agency may adopt more rigorous rules regarding worker exposure to chromates and chromate emissions during manufacturing within the next few years.

Nontoxic Corrosion Resistance for Aluminum



Aluminum treated with easily applied hydrotalcite coating (shown here) demonstrates strong corrosion resistance without the toxic and carcinogenic hazards posed by conventional chromate coatings.

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ENERGY EFFICIENCY AND RENEWABLE ENERGY • U.S. DEPARTMENT OF ENERGY

In the quest to eliminate hexavalent chromium from aluminum coatings, the University of Virginia's Department of Materials Science has devised a new coating process. The new hydrotalcite coating process is completely nontoxic and has demonstrated comparable corrosion resistance to chromate coatings for most aluminum alloys.

Project Description

Goal: The goal of this project was to better understand the chemistry of the hydrotalcite coating process and to optimize it for commercial use.

The hydrotalcite solution can be substituted for chromates in spray or bath processes. The coatings can be applied either by dipping aluminum products into an alkaline lithium salt bath for a few minutes or by spraying them with the same solution. Pretreatment with hydrotalcite coating provides excellent corrosion protection and enhances adhesion of paint for the full range of aluminum products.

The University of Virginia developed this new technology with the help of a grant funded by the Inventions and Innovation Program through the Department of Energy's Office of Industrial Technologies.

Progress and Milestones

- Process chemistry and salt bath formula have been optimized for use on architectural alloys.
- A license was issued for use of the process on architectural aluminum.
- The Defense Advanced Research Project Agency has funded additional research into using the hydrotalcite coating process for aerospace alloys.

Economics and Commercial Potential

- The technology is now ready for commercial use on low-copper alloys.
- Possible restrictions on hexavalent chromium could place hydrotalcite technology in very high demand.

The Inventions and Innovation Program works with inventors of energy-related technologies to establish technical performance and to conduct early development. Ideas that have significant energy-savings impact and market potential are chosen for financial assistance through a competitive solicitation process. Technical guidance and commercialization support are also extended to successful applicants.

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