DRIVEALUMINUM

Aluminum builds a better vehicle.

Aluminum Corrosion 101: Types and Prevention

When properly sealed and coated, an aluminum vehicle body is inherently more corrosion resistant than an equivalent steel body. This corrosion-resistant quality is one of the reasons aluminum is a material of choice in the automotive, commercial transportation and defense industries.

However, under specific conditions, painted or unpainted automotive aluminum can develop three different corrosion types that are primarily cosmetic. Galvanic, filiform and crevice corrosion predominantly affect surface layers only, and can influence paint retention. These types of corrosion do not penetrate through the thickness of the material and thus do not weaken the structural integrity of an aluminum part.

GALVANIC CORROSION

Galvanic Corrosion: Occurs when a metal is in contact with a dissimilar metal or a non-metallic conductor and the joint is exposed to a common corrosive electrolyte, such as salt water.
Galvanic corrosion can occur if all three conditions are met:

- Contact between unprotected surfaces of two dissimilar metals
- Corrosive liquid in joint
- Electrical current path across joint

The rate of galvanic corrosion is very slow, requiring many hours of exposure to an electrolyte before visible corrosion is observed.

FILIFORM CORROSION

Filiform Corrosion: Occurs on the surface of aluminum under paint, primers and coatings. More common in warm and humid environments, such as coastal cities or industrial areas.
Filiform corrosion can occur if all three conditions are met:

- Painted or coated aluminum surface
- Presence of corrosive liquid (typically salt water)
- Damage to surface coating allowing corrosive liquid to penetrate under coating

Removal of coatings and corrosion by sanding, followed by refinishing with OEM-recommended refinish materials repairs filiform corrosion**.**

CREVICE CORROSION

Crevice Corrosion: Occurs in a joint in contact with another material when a corrosive liquid such as salt water is present between the crevice (narrow opening) of two surface materials (aluminum, steel, plastic, etc.).
Crevice corrosion can occur if two conditions are met:

- Crevice (thin joint) between surfaces of two materials
- Presence of corrosive liquid in crevice joint (typically salt water)

Higher temperatures, salt content and other factors can accelerate crevice corrosion.

Sources

1. Aluminum Association, *Corrosion Types for Aluminum Parts Used in Vehicular Applications*, 2016.
2. G.M. Scamans, A. Afseth, G.E. Thompson, J. Liu and X. Zhou, *Aluminum Automotive Closure Sheet Corrosion*, 2006.

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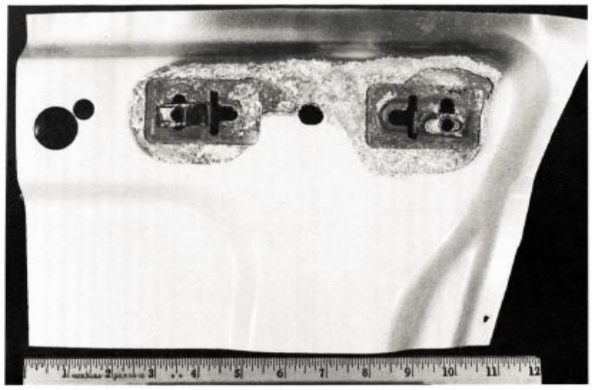
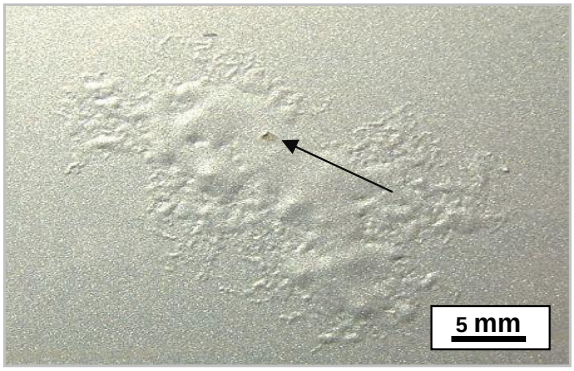
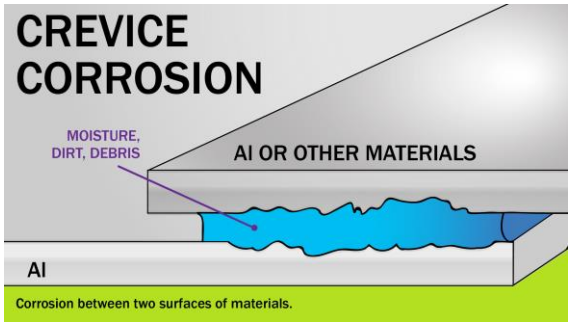


Galvanic corrosion of aluminum. A steel member (not shown in the picture) approximately the size and shape of the corroded region was in contact with the aluminum sheet.



Filiform corrosion attack on aluminum part from a vehicle in service. The arrow points to the paint defect where the corrosion initiated.



Crevice corrosion occurring between two materials. The mating surfaces can be aluminum to aluminum, aluminum to steel, or aluminum to plastic.

Prevention

Thoroughly clean surfaces and eliminate defects (e.g., pores, mechanical damage, air bubbles, insufficient coverage, etc.) prior to finishing and coating

- ✓ Use OEM-recommended primers, adhesives, sealers (including seam sealers), coatings and refinish materials
- ✓ Use OEM-recommended coated fasteners and insulating washers
- ✓ Minimize exposure to salt water

For a more detailed report on aluminum corrosion, download *Corrosion Types for Aluminum Parts Used in Vehicular Applications* (2016) at www.DriveAluminum.org.

Sources

1. Aluminum Association, *Corrosion Types for Aluminum Parts Used in Vehicular Applications*, 2016.
2. G.M. Scamans, A. Afseth, G.E. Thompson, J. Liu and X. Zhou, *Aluminum Automotive Closure Sheet Corrosion*, 2006.