



Inorganic Coatings for Anodized Aluminum Parts

1 Scope

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Material Description. This specification covers requirements for anodized surfaces of pure aluminum or pure aluminum alloys with an additional inorganic coating (example: sol gel process). This coating is applied to an incompletely sealed anodized surface.

1.2 Symbols. Not applicable.

1.3 Applicability. This additional coating is used to improve the chemical resistance of anodized aluminum parts for exterior decorative applications.

1.4 Remarks. For conventional anodize and seal (without topcoat), see GMW14665-DET-Class B. For organic clearcoat over anodizing, see GMW16929.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

ISO 1463 ISO 2808

2.2 GM Standards/Specifications.

GMW3059	GMW14458	GMW14729	GMW16929
GMW14124	GMW14665	GMW14829	
GMW14270	GMW14698	GMW14865	
GMW14334	GMW14701	GMW15287	

3 Requirements

See Appendix A, Table A1 and Table A2 for additional information.

3.1 Appearance. Parts with an additional coating to this specification shall not show defects such as high film build on edges or any orange peel. The general finish of the part must be free from polish defects, scratches, or other similar defects. Also there shall be no dull/matte areas or cloudiness.

3.2 Coating Thickness. Measure coating thickness per ISO 1463.

The supplier shall report the thickness of anodizing and topcoat layers individually. For each inorganic topcoat technology, GM Materials Engineering and the supplier shall establish minimum and maximum values for each attribute which ensure all coating performance requirements are met.

3.3 Adhesion.

3.3.1 Initial Adhesion. Test per GMW14829 method A. Coating shall exhibit a rating of 0 or 1.

3.3.2 Humidity + Tape Adhesion. Expose samples to 240 h of humidity per GMW14729. Samples shall exhibit a maximum rating of 1 after 120 h. No cracks, blisters, delamination, or crazing are permitted after 240 h.

3.4 Filiform Corrosion. Expose samples according to GMW15287. Samples shall exhibit 4 mm maximum creepback from scribe line at the end of the test. No cracks, blisters, delamination, or crazing are permitted after the exposure. Also, there shall be no filament growth on the non-scribed test surfaces at the end of the test, excluding sample prepared cut edges.

3.5. Acidified Salt Spray (CASS). Expose samples according to GMW14458 for a minimum of 8 h. No base metal corrosion shall be permitted at the end of the test.

3.6 Scratch Resistance. Perform scratch resistance according to GMW14698 in the as-received condition and after 144 h of humidity (GMW14729). The spring tension at which the tip of the test rod just fails to penetrate the coating shall be recorded. A minimum spring tension of 4.0 N with no penetration is required.

3.7 Resistance of Coatings to Chemical Etching and Distortion. For initial approval, samples must achieve the following minimum ratings for materials listed in GMW14701:

- Rating 8: Egg Albumin, Acid Rain pH 3 and pH 4, Tap Water, Sulfuric Acid pH 4.
- Rating 6: Sulfuric Acid pH 0 and pH 2.
- No requirement: Brake Fluid.
- Rating 10: All other materials listed in GMW14701.

Any temporary/reversible changes in the coating due to exposure to any material must be reported to Materials Engineering.

3.8 Automotive Environmental Cycling (GMW14124). There shall be no coating cracking or adhesion loss after 15 cycles of Cycle A plus 96 h of humidity (GMW14729). Adhesion (GMW14829 Method A) must be run after humidity. A maximum rating of 1 is allowed.

3.9 Simulation of Car Wash Installations (GMW14865). This test must be run on flat panels. After 200 test strokes, there shall be no more than a 20% change in gloss value (examples: an initial gloss reading of 80 shall not be reduced to lower than 64, and an initial gloss reading of 20 shall not be reduced to lower than 16). Coating tested may also compare favorably to an approved control sample. Final acceptability judgment is to be made by GM Materials Engineering.

3.10 Temperature Resistance. One hour at $100\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$. No cracks, blisters, or other discontinuities visible on the surface are permissible after the exposure.

3.11 Resistance to Cleaning Agents. Test per GMW14334, using agents appropriate exterior coatings (identified as "Code B" in GMW14334). Requirement: Rating 2.

4 Manufacturing Process

This type of coating must be approved in combination with anodizing as a system approval.

5 Rules and Regulations

5.1 Legal Regulations. All materials must satisfy applicable laws, rules, regulations and recommendations valid in the country of usage.

5.2 Language. In the event of conflict between the English and domestic language, the English language shall take precedence.

5.3 Inspection and Rejection. Samples of components or materials released to a GM material specification shall be tested for conformity with the requirements of this material specification and approved by the responsible Engineering department prior to commencement of delivery of bulk supplies.

A new approval must be received for any changes, e.g., properties, manufacturing process, location of manufacture, etc. If not otherwise agreed, all testing and documentation normally required for initial release must be completed.

It is the responsibility of the supplier to inform the customer in a timely manner, without solicitation, and to include documentation of all modifications of materials and/or processes and to apply for a new release.

5.4 Material Safety Data Sheets/Safety Data Sheets (MSDS/SDS). For new product submissions, or when a change in chemical composition of an existing product has occurred, a complete copy of the Material Safety Data Sheet/Safety Data Sheet must be submitted in compliance with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) requirements or other country-specific MSDS/SDS requirements.

5.5 All materials supplied to this standard must comply with the requirements of the International Material Data System (IMDS) and GMW3059, **Restricted and Reportable Substances**.