

# **Current Status and Issues of Accelerated Corrosion Tests for Evaluating Corrosion Resistance of Coated Steel Sheets in Automobiles**

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## **Abstract**

Automobiles are used in diverse environments, as both producing areas and consuming areas are expanding worldwide. Changes are also occurring in the component materials of automobiles. The use of light metals, resins and other nonferrous materials is increasing. Corrosion protection quality design of automobiles has become more difficult due to these changes in materials and the environment surrounding automobiles.

For corrosion protection quality design of automobiles, mainly two methods are conceivable. One is an inductive method based on analysis of past corrosion performance data from actual automobiles. This is a sure method if the structure and element materials that comprise an automobile are already known. The other method is estimation of the corrosion protection quality of new materials. In this case, corrosion protection quality performance must be evaluated and estimated by some type of corrosion test.

The purposes of using corrosion tests can be divided broadly into quality control and evaluation of corrosion resistance in the use environment. In the former, test methods provided in standards are used in factory shipping inspection, receiving inspections, etc. of materials and parts. Because the evaluation results are necessary within a short time period, corrosion is accelerated in many cases. The latter is used for purposes such as evaluation of the performance of materials or parts in the intended use environment, or developmental testing of materials and parts corresponding to the purpose of use, tests to reproduce the use environment, elucidation of the mechanism of corrosion, etc. Ideally, a correlation between the two types of corrosion tests is desirable, but in actuality, the two types frequently diverge. Corrosion reaction is a chemical reaction between a material and its environment. Since accelerating a reaction creates a condition that does not conform to reality, "acceleration" and "reproduction" intrinsically exist in an antinomic relationship. Moreover, since an automobile consists of various materials, in principle, it is not possible to accelerate them on the same temporal axis as if in a time machine. However, from the viewpoint of industrial necessity, accelerated corrosion tests have been used in a confused manner for many years without resolving the inherently contradictory purposes of "acceleration" and "reproduction." Research and development of corrosion "acceleration" test methods with high market "reproducibility" have been carried out in a variety of fields for many years up to the present. As a result, although this has been a trial-and-error process, test methods with comparatively high market reproducibility have been developed, and several of those methods have been standardized and are widely used. However, a unified consensus still has not been obtained. The engineers grappling with corrosion protection quality are confronted with especially difficult

challenges in comparison with other types of quality design. The author proposed first clarification of the corrosion protection quality of a new material by an accelerated corrosion test that reflects the object corrosion mechanism with high reproducibility, even though acceleration is low, followed by use of accelerated corrosion tests in quality control when various specific evaluations are required.

The author introduces an outline of the development and history of standardization of the accelerated corrosion tests that are used for developments of automobiles in the world, and summarize, to the best of his abilities, the ideal form of accelerated corrosion tests in the future.