Product Introduction

Topcoat treatment on zinc-based plating

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Introduction

Most of the zinc and zinc alloy plating in Japan are finalized by chemical conversion coating, but there are also specifications to apply topcoat coating treatment after chemical conversion coating treatment. Although the purpose of the topcoat treatment varies, the following are mentioned as the main ones:

- Improvement of corrosion resistance
- Adjustment and improvement of fastening characteristics of fastening parts
- Improvement of treatment appearance
- Prevention and reduction of galvanic corrosion in composite materials, etc.

Though the popularization rate of topcoat at present in the country is not high, it is considered that the demand will increase in future mainly for the above-mentioned purpose.[1]

Product Summary

We have a lineup of an aqueous organic-mineral topcoat, an aqueous inorganic silica type topcoat, and a nonaqueous organic-mineral topcoat as topcoats for zinc-based plating (Table 1).

Features

Aqueous organic-mineral topcoat

- Be most commonly used for zinc plating.
- Can be selected by required friction coefficient.
- Can be diluted with water and easy to handle.
- Can be treated with the same level of equipment as the post-treatment of zinc plating.

Aqueous inorganic silica type topcoat

- Provide high heat resistance of the film.
- Provide the almost same coefficient of friction as the chemical conversion coating.
- Can be diluted with water and easy to handle.
- Can be treated with the same level of equipment as the post-treatment of zinc plating.
- Be not suitable for bending or caulking processing.

Nonaqueous organic-mineral topcoat

- Provide both heat resistance and flexibility of the coating.
- Form a tough coatings by siloxane bonding.
- Be used in explosion protection equipment.

Product name	Solvent	Classification	Coefficient of friction	Color	Remarks
TR-705	Aqueous	Organic-mineral	-	Clear	For Rack
TR-701	Aqueous	Organic-mineral	0.08 to 0.13	Clear	For barrel Low friction type
TR-700	Aqueous	Organic-mineral	0.12 to 0.18	Clear	For barrel
TR-108	Aqueous	Organic-mineral	0.14 to 0.20	Clear	For barrel High corrosion resistance type
TR-735T	Aqueous	Organic-mineral	0.24 to 0.30	Clear	For rack or barrel High friction type
TR-740	Aqueous	Organic-mineral	0.20 to 0.25	Black	For barrel High Temperature resistant type
TR-170	Aqueous	Inorganic silica	0.30 to 0.40	Clear	High corrosion resistance of the inner non-plated part Low-cost type
TR-712	Aqueous	Inorganic silica	0.30 to 0.40	Clear	High corrosion resistance of the inner non-plated part
TR-720	Nonaqueous	Organic-mineral	0.24 to 0.30	Clear	High corrosion resistance type

Table 1: Topcoat Lineup

*In addition to the above lineup, the company is also licensing and marketing COVENTYA's FINIGARD.

Mechanisms

This paper explains the mechanism of corrosion resistance improvement and friction coefficient adjustment using aqueous organic-mineral topcoat most often used in the topcoat for zinc-based plating as an example. Figure 1 shows a film structure model when an aqueous organic-mineral topcoat is treated on zinc plating.

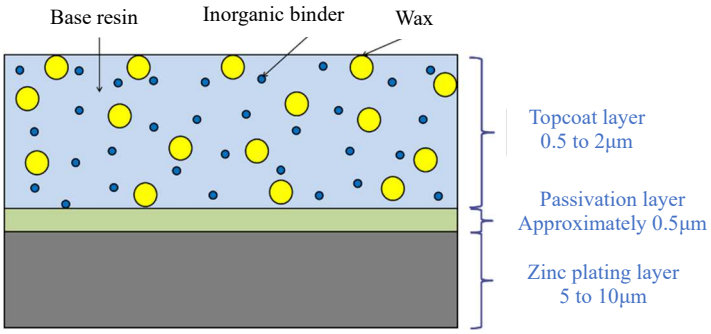

Figure 1: Aqueous Organic-mineral Topcoat on Zinc Plating

Although the passivation layer is for suppressing the corrosion progress of the zinc plating layer, it also functions as a primer for strengthening the adhesion between the zinc plating layer and the topcoat layer in addition to this function.

The topcoat layer has a thickness of approximately 0.5 to 2μm, depending on the treatment method, and has a structure in which an inorganic binder and wax are dispersed in the base resin.

Corrosion resistance is improved by the covering effect of the topcoat layer which is firmly adhered to the zinc plating layer via the passivation layer.

The inorganic binder contributes to the thickening of the topcoat layer and the improvement of the film strength. As a result, it leads to enhanced corrosion resistance.

Wax contributes to adjust of coefficient of friction of fastening parts, etc. Target coefficient of friction can be obtained by adjusting the type and amount of wax added.

Although the passivation layer on the zinc-based plating has an iridescent color because it is very thin, iridescent color disappears by the topcoat layer is added to this, the metalic color of the plating itself becomes visible. For example, in many cases, zinc-nickel alloy plating subjected to trivalent chromium chemical conversion treatment has a blue color, but the iridescent color disappears due to the topcoat treatment, resulting in a color tone similar to that of stainless steel.

In closing

Topcoat treatment without changing the process itself of the conventional zinc-based plating, it can be realized corrosion resistance improvement and improvement of fastening characteristics by performing additionally. Therefore, it is a technical with a high possibility that demand will increase in the future for the purpose of raising the level of the current specification and stabilizing the quality.

Especially, the application to fastening parts such as volts is effective, but the selection of the product according to the targeted friction coefficient is necessary.

Literature

1: Hideo Susa; *J. Surf. Finish. Soc. Jpn.* Vol.70, No. 8, pp. 388-393 (2019)