Topics

Quantitative Evaluation of Glittery Feeling of Metallic Paint Coated Plastic Parts

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1. Introduction

Of all paint-coated plastic parts (vehicles, mobile phones, electrical appliances, etc.), those that can have a metallic appearance with a better glittery feel than conventionally painted parts are drawing attention. A quantitative scale for expressing such a glittery feel has still to be established. Thus, at present, evaluation of the glittery feel depends on a sensory evaluation based on visual inspection. In this connection, we attempted to create a quantitative evaluation equation by analyzing the relationship between the sensory characteristics of the glittery feel and the reflection characteristics. The purpose is to develop a quantitative evaluation method, which is highly correlated with the visual evaluation.

2. Method

We quantified the glittery feel with a sensory evaluation based on the paired comparison method. We measured the reflection characteristics using a gonio-spectrophotometer (Murakami Shikiken, GCMS-4T). For influence factors, we prepared several samples by changing the type of glittery flake pigment, undercoating, clear coating and color. Subjects for a paired comparison (7 persons including the designers) made visual evaluations normal usual office illumination (illuminance: about 700 lx). They evaluated the glittery feel of the given pairs of samples in 5 grades. In addition, they made another evaluation test using actual parts including chrome-plated parts.

3. Result

The most influential factor concerning the glittery feel is the type of glittery flake pigment. Flake pigment C had the highest glittery feel followed by flake pigments B and A, in this order. For flake pigment C, it was noted that the glittery feel improved when the sample is undercoated (**Fig. 1**). As a result of measuring the reflection characteristics, chrome-plated material D had the highest value for contrast between the regular reflection peak and the shaded region followed by flake pigments C, B and A, in this order (**Fig. 2**). Based on these results, it is understood that the principal factor that controls the glittery feel is the contrast between the regular reflection region and the shaded region.

For the purpose of a quantitative evaluation, we created an evaluation equation, Ydl, using the reflection factor, Ys, in the shaded region.

$$Ydl = \log Ys \quad \cdots\cdots(1)$$

A favorable correlation result of over 0.9 was obtained (**Fig. 3**) between the evaluation equation and visual evaluation. During the evaluation of metallic paint coated materials, favorable results can be acquired by using the contrast between the highlighted region and the shaded region.

4. Conclusion

We succeeded in acquiring a glittery feel evaluation equation that coincides well with visual evaluation. The presently created evaluation equation can give a quantitative evaluation of glittery feel of not only metallic painted coatings but also chrome-plated coatings. In addition, it was confirmed that this evaluation equation can be applied to actual parts with favorable results.

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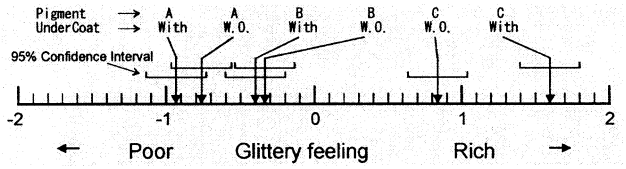

Fig. 1 One of sensory evaluation results.

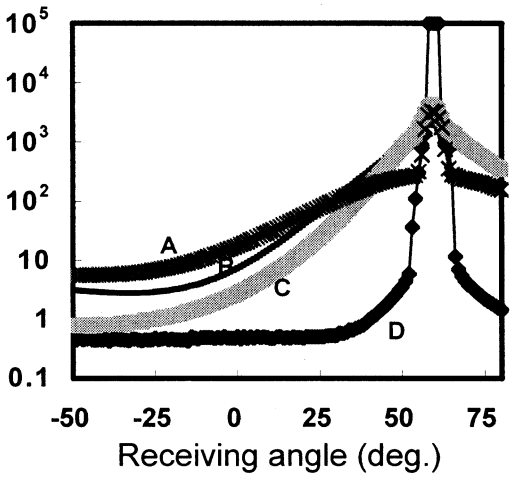

Fig. 2 Reflection characteristics of samples. Incident angle: 60 deg.

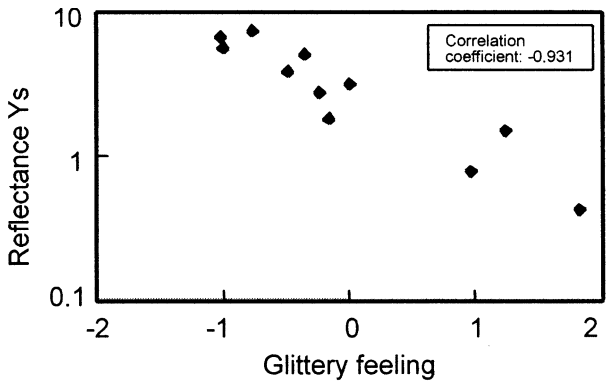

Fig. 3 Relation between glittery feeling and reflectance.