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The Elaboration of Specialized Coatings used for Substrates in Vacuum Sputtering Technologies

A.Urbahs*, K.Savkov, Z.Smorodova***, U.Gravitis******

**Riga Technical University, Kaļķu 1, LV-1658, PDP, Riga, Latvia,E-mail: aleksandrs.urbahs@rtu.lv*
***Riga Technical University, Kaļķu 1, LV-1658, PDP, Riga, Latvia, E-mail: sakon@inbox.lv*
****Riga Technical University, Kaļķu 1, LV-1658, PDP, Riga, Latvia, E-mail: zoja.filipova@rtu.lv*
*****Riga Technical University, Kaļķu 1, LV-1658, PDP, Riga, Latvia, E-mail: uldis.gravitis@rtu.lv*

Abstract

The main issues are considered in this topic: creation of regenerating and protecting covers using ion-plasma sputtering technology; applying different sources of sputtering material
KEY WORDS: *composite coatings, sputtering*

1. Introduction

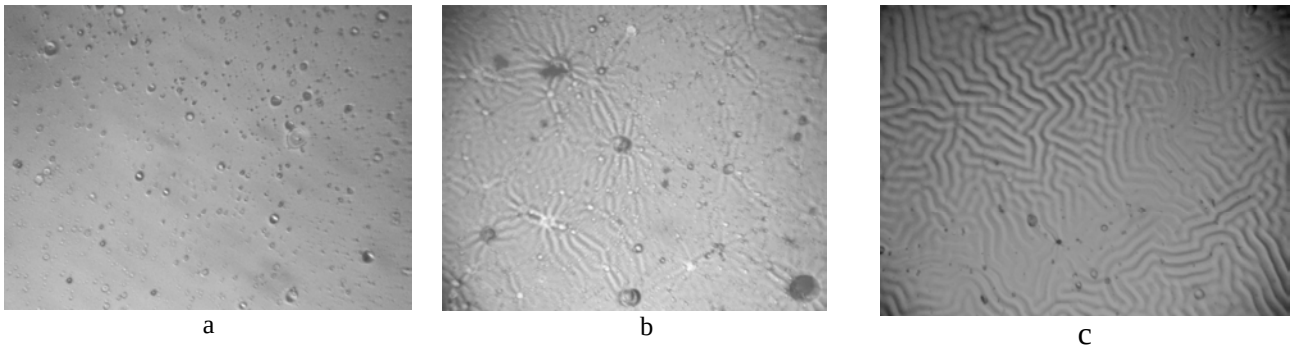
In the development of restoration and protection coatings for various products the ion-plasmas covering technology has a wide spread. At the same time, the coatings like these may have some drawbacks as adhesion to different substrates, low corrosion resistance, high fragility, etc. Besides, sputtering the fusions of different kinds, sputtered material content alteration may occur while contacting the surface. These factors decrease the exploitation and decoration properties of coatings and narrow the range of their application. The scientific work represents the results of a complex investigation of the application possibilities lacquers on the basis of acryl resins as the basis of mirror coatings creation. Lacquer priming layer for covering metal articles has several functions: the elaboration of smooth and flawless surface, improvement of articles corrosion resistance by avoiding the galvanic contact with the sputtered coating and the atmosphere, and the decrease of polymer materials gas evolution.

2. Investigation of specialized coating

One of the problems stemming from the application of priming lacquers is their low heat resistance which may lower the quality of vacuum coating both while its creation and in the process of its future exploitation. This issue is especially important with details working under high temperatures, for instance, reflecting surface of car headlights, since their temperature may reach 120^0 C.

Coating heat resistance depends considerably upon the type of priming layer, sputtering regimes, thickness of the sputtered coating, and the material of substrate. The loss of heat resistance results in the loss or deterioration of surface reflectivity, decrease of reflection coefficient, appearance of nacre, haze defect. These drawbacks are generally the results of lacquer coating deformation under the tension of sputtered layer.

In the represented micro-photos (Fig. 1) it is possible to see that, in case of smoothness loss, there appears a wave-type structure on the surface; moreover, the coating haze defect increases along with the increase of waves' amplitude.



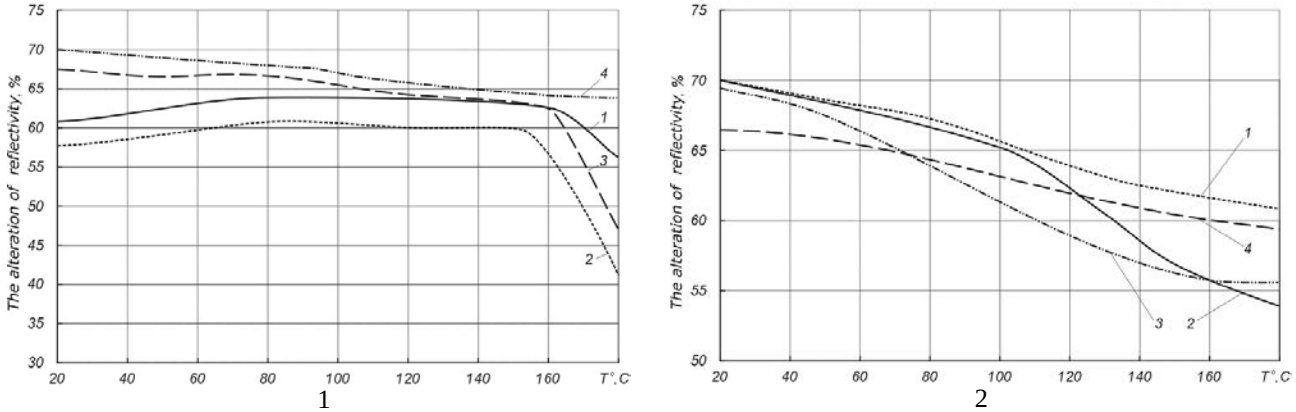
a b c

Fig.1 Micro-photos of lacquer coating after tests, x460: a – glossy surface; b - nacre surface; c - lusterless surface

To carry out the investigation, the lacquers of three types (Sikkens Autoclear plus, Sikkens HS plus, Lesonal) having different correlation of components (lacquer, hardening agent, solvent) were used. The sputtering with a special

sprinkler was being accomplished until a homogenous layer requiring future high temperature drying appeared. Upon the prepared basis the aluminum have been being sputtered for 7 minutes by means of vacuum device НВВ-6, 6-И1. There have been chosen the following investigation aspects: coefficient of reflection and roughness of surface. The reflection coefficient was measured with a device "PICOGLOSS 503" using various angles of reflection (20^0, 60^0 and 80^0), the surface roughness – with "TR 100 Surface Roughness Tester Rz".

The results of the investigation are represented in Fig.2 (1, 2, 3,4 – according to 20, 60, 100 and 140% solvent concentration in accordance with lacquer content). In an experimental way, it was discovered that all investigated lacquers have endured 120 C without any loss of smoothness. Under 140 C there appeared a slight nacre on the samples of Sikkens HS plus and Lesonal; the samples of Sikkens Autoclear plus have endured 180 C without any visible changes.



1 2

Fig.2 The alteration of reflectivity for 60^0 light dropping angle depending on the temperature:
1- coating on the basis of lacquer Sikkens Autoclear plus; 2- coating on the basis of lacquer Lesonal

3. Conclusion

The investigation proved that all investigated lacquers can be applied as priming coats for the restoration of cars headlights reflectors.