REFLECTING POWER OF STELLITE AND LACQUERED SILVER

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I. REFLECTIVITY OF STELLITE

In a previous communication [1] data were published on the reflecting power of stellite which is reported to be an alloy principally of chromium, cobalt, and molybdenum.[2]

The apparatus used was a mirror spectrometer, fluorite prism, and a vacuum thermopile of bismuth silver, as described in previous papers. The source of radiation was a Nernst glower. The reflectivity data were obtained by comparison with silver. In order to determine the absolute reflecting power, the observed data were corrected for absorption by the silver mirror.

TABLE 1.—Reflecting Power of Stellite

Wave length μ=0.001 mm	Reflectivity	
	No. 1	No. 2
μ	Per cent	Per cent
0.45	62.0	64.0
.50	63.6	66.0
.55	64.5	69.5
.60	65.2	71.0
.65	65.8	72.2
.70	66.5	72.5
.80	67.5	73.0
.90	68.3	73.5
1.00	68.9	74.0
1.20	70.1	74.5
1.40	71.2	75.0
1.50	71.9	75.3
1.75	73.3	76.0
2.00	74.7	76.8
2.50	77.1	78.6
3.00	79.2	80.0
3.50	81.0	81.4
4.00	82.5	82.8

The sample examined (No. 1 in Table 1) was plane, quite highly polished, but it was not of uniform homogeneity. The new data presented herewith were obtained on a very homogeneous, highly

[1] This Bulletin, 14, p. 315; 1917.

[2] Obtainable from the Haynes Stellite Co., Kokomo, Ind.

polished plane mirror (sample No. 2, Table 1), about 3 cm. in diameter. Its optical properties differ from those of the preceding sample in that the reflecting power is considerably higher in the blue and yellow part of the spectrum. Beyond 3 μ in the infra-red the reflecting power of these two samples is practically the same.

Evidently the reflecting power will be greatly affected by the composition of the alloy and, hence, in exact work where stellite mirrors are used, the reflecting power of new samples should be determined. However, the present data give one some idea of what is to be expected in comparing the reflecting power of this material with that of other metals used for reflecting mirrors.

II. REFLECTIVITY OF LACQUERED MIRRORS

Theoretically a lacquered silver mirror should reflect almost as much light as does an unlacquered surface. In practice, however, the reflecting power was found to vary greatly with the homogeneity of the lacquered surface.

For making these tests, various water-white silver lacquers such as "Albaline," "Zapon," etc., were diluted, filtered, and poured upon freshly polished silver-on-glass mirrors. The excess material was allowed to drain off and the mirror placed in a level position to dry.

A newly lacquered silver mirror was found to reflect from 70 to 75 per cent of the incident yellow light. In the red end of the spectrum it reflected from 80 to 85 per cent, as against 90 to 95 per cent for unlacquered silver. No doubt by using an especially prepared lacquer, which has been thoroughly filtered to remove the discrete particles of nitrocellulose, a higher reflecting power can be obtained.

In the near infra-red where nitrocellulose is free from absorption bands the reflecting power increased gradually to about 95 per cent, but beyond 3 μ the reflectivity curve shows deep indentations owing to selective absorption of the lacquer.

Effect of Ultra-Violet Light.—Lacquered silver mirrors can not be used near sources of ultra-violet light owing to photochemical action which occurs in the lacquer. As a result the silver under the lacquer is turned brown in color, following exposure to a carbon arc or a quartz mercury vapor lamp.

For example, after six hours' exposure at a distance of 0.5 meter from a small (15 amp.) carbon arc, it was found that a lacquered silver-on-glass mirror had changed to a brownish color, which

greatly increased the absorption in the violet. This is well illustrated in the last column of Table 2.

From these data it is evident that, in a powerful searchlight, such a lacquered silver mirror would be injured in a few hours. A bare nickel-plated glass mirror would be just as efficient. A gold-plated mirror would be more satisfactory.

TABLE 2.—Reflecting Power of a Lacquered Silver Mirror Before and After Exposure to Ultra-Violet Light

Wave length in μ=0.001 mm	Reflectivity	
	Before exposure	After exposure
μ	Per cent	Per cent
0.55	68.6	62.0
.60	73.5	68.7
.65	77.0	73.8
.70	79.8	77.5
.75	81.9	80.5
1.00	87.8	....
1.25	90.8	....
1.50	93.2	....
2.00	95.0	....

III. SUMMARY

The object of the present paper is to give data on the reflecting power of the latest production of stellite and also of lacquered silver mirrors. It is shown that the reflectivity of stellite varies somewhat in the visible spectrum depending upon the homogeneity and no doubt upon the exact composition of the alloy.

Data are given on the reflecting power of lacquered silver mirrors, before and after exposure to ultra-violet light. It is shown that owing to photochemical action in the lacquer the silver is turned brown in color, thus reducting its reflecting power.

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