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On the nature of glazing and reflectivity of used utensils at various localities of North-East India

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ABSTRACT

The present work reports an interesting environmental phenomenon observed at few geographical location in North-East India. This is related to the glazing of silver, aluminum and stainless steel utensils. When brass with common detergent powder using the water used for the purpose at the respective location. It is observed that at some places the utensils exhibit brilliant silvery colour after they are clean with water as usual. On the other hand at some places the utensils are extremely difficult to be cleaned and observed the original colour. We have observed the phenomenon at various places like Shillong peak (25.35 N, 91.56 E), Guwahati (26.11 N,91.47 E), Sibsagar (26.59 N, 94.41 E), Dibrugarh (27.29 N, 94.58 E), Tinsukia(27.20 N, 96.10 E) , Doomdooma (27.25 N, 96.15 E) and Namdeori (26.49 N, 94.16 E). The observations are taken during span of last three years. A proper explanation of the environmental effect is attempted in this work and results are presented.

Key words: glazing, reflectivity

INTRODUCTION

In general highly polished metallic surfaces have a higher reflectance than dielectrics. At normal incidence, for example, silver and aluminum reflect over 90 percent of all visible light. Experiments show that the reflectance depends not only on the particular metal but on the preparation of the surface and on the wavelength and direction of the incident light. If plane polarized light is reflected from a metal at other than normal incidence, the p and s components of the incident electric vector are reflected with a phase difference and this gives rise to elliptical polarization. It is a general observation for all metals that plane-polarized light is not reflected as plane-polarized light except when it vibrates either in the plane of incidence or perpendicular to it.[1].

The reflector of a metal usually varies considerably with wavelength. In spite of irregularities at shorter wavelength, all metals reflect very well in the visible (particularly red) and infrared. The face plate of the Appollo Space suits worn by the astronauts on the moon were coated with a thin layer of gold. The coating reflected at least 70 percent of the light from the sun. Objects seen through the visor appear light-blue or green in colour, but the eyes readily adapt to this colour, which soon appears to be practically white. Such face plates are designed to decrease the thermal load on the suit's cooling system by strongly reflecting the infrared radiation from the sun while transmitting sufficient visible light. Gold films deposited on the surface of a sheet of plastic to be used as window shades are to be found on the sunny sides of many houses and office buildings for the same reasons.

Silver, stainless steel and aluminum are of particular importance for general use because they maintain their high reflectance throughout the visible spectrum. In the present work we report an interesting phenomenon which is related to the subject of reflection from a metal surface. This is concerned with the glazing of silver, aluminium and stainless steel utensils. It is observed that at some places the utensils are extremely difficult to be cleaned and observe the original colour. The problem is directly related to the surface layer of the utensils of stainless steel and aluminum.

MATERIALS AND METHODS

Experimental:
For the purpose of observing the phenomenon of glazing of utensils we have used commercially available polaroids for observing the polarization by reflected light, photodiodes to record the reflectivity and a ASCO pocket spectroscope to observe visually the red ,yellow, green sector of the spectrum under reflected light. We have visites various places like Shillong peak (25.35 N, 91.56 E), Guwahati (26.11 N,91.47 E), Sibsagarh (26.59 N, 94.41 E), Dibrugarh (27.29 N, 94.58 E), Tinsukia(27.20 N, 96.10 E) , Doomdooma (27.25 N, 96.15 E) and Namdeori (26.49 N, 94.16 E). The observations are taken during a span of last three years.

RESULTS AND DISCUSSION

First of all, it is important to understand why stainless steel is so corrosion resistant. The alloying elements in stainless steel form a thin, transparent "**passive layer**" on the surface. Although this protective passive layer is only a few atoms thick, it instantaneously reforms in the presence of oxygen from air or water, so even if the material is scratched or damaged the passive layer continues protecting the surface from corrosion. This explains why stainless steel does not require any coating or other corrosion protection to remain bright and shiny even after decades of use.[2-5]

But the problem of different glazing at different places is presumably an environmental one. As shown in Table I when the reflected light is examines with a hand spectroscope (the sample being used is a glazes stainless steel glass) the red sector of the spectrum indicates significant change. This observation

Table 1: Observation of the glazed stainless steel glass with the help of a pocket spectroscope.

Sample No.	Location	Intensity of the Red Sector	Intensity of the Green-Yellow Sector
1.	Shillong peak	vvw	S
2	Doomdooma	vw	ms
3	Dibrugarh	s	s
4	Sibsagar	w	ms
5	Tinsukia	ms	w
6	Guwahati	ms	s
7	NamDeori	s	ms

S=strong, ms=medium strong, vvw=very very weak etc

Table 2. Measurements of the intensity of the glazed utensils with the help of a photodiode.
The samples are arranged according to Table 1

Sample No	Intensity (magnitude of the photocurrent in terms of digits)
1	0135
2	0095
3	0016
4	0089
5	0009
6	0010
7	0009

As many be inferred from Table 2 the intensity as sufficiently high for sample 1 and 2. Observation made with the help of polaroids do not exhibit any significant variation of polarization of the reflected light.

CONCLUSION

We have carried out some qualitative and quantitative work about glazing of utensils at various locations. The present works do indicate the nature of the phenomenon and the explanation associated it.

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