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The Phosphorescence of Fused Quartz

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COMPARATIVE RESULTS

Temperature	Lees' Formula	Modified Formula
Sulfur		
22°C	$5.96x10^{-4}$	$7.93x10^{-4}$
40	6.33	6.35
53	5.91	5.97
Sulfur-Coke Mixture		
39	10.79	11.89
64	18.76	18.45

The symbols involved are as follows:

k = thermal conductivity.
k_m, h_u, emissivity at temp. of m or of u.
U_m, U_u, temperature of m or U.
t_m, t_s, thickness of m or of S.
r, the radius of one of the disks — about 2 cm.
a and b are constants involved in the emissivity equation,

$$h = a + bU.$$

Their value was determined by a separate experiment.

THE PHOSPHORESCENCE OF FUSED QUARTZ

A. C. Bailey

Experiments performed here corroborate the report of Drummond and Webster that fused quartz can be activated to phosphorescence by being irradiated with ultra violet light from a quartz mercury vapor lamp. It is also found that the fused quartz is thermoluminescent. The radiations emitted from the phosphorescent and thermoluminescent quartz appear to be confined largely, if not completely, to the visible region. These radiations, however, at ordinary room temperatures, are of such low intensity as to be invisible to the eye.

If the fused quartz is raised to a temperature considerably above that of the room, the intensity of the radiations becomes sufficiently great as to make the glow distinctly visible. At ordinary room temperatures the phosphorescence is sufficiently strong to produce an image of the quartz on a photographic plate within one of two days exposure. If the quartz is thermally agitated to visible luminescence, the image may be obtained within a few seconds.

The phosphorescence appears to be confined chiefly to the edges particularly the broken edges of the quartz and to scattered spots. These scattered spots glow very brightly when the quartz is agitated to thermoluminescence. The glow persists for half an hour, more or less; the length of time depending upon the intensity of the thermal agitation and upon the amount of energy absorbed during irradiation. Quartz which has not been subjected to ultra violet radiations for nearly a year is still strongly thermoluminescent.

Radiations of longer wave length than 340 mu. do not activate the quartz to any marked degree. The radiations emitted from the fused quartz are transmitted by glass apparently as well as by quartz.

Quartz crystals do not appear to exhibit either phosphorescence or thermoluminescence at temperatures below red heat. Crystals heated by C. E. Erion of the Chemistry Department, to 550°C and to 1100°C. and the cooled and subsequently irradiated fail to show any luminescent properties. However, crystals heated to 1600°C. and then cooled and irradiated with ultra violet light show the same characteristic glow as does fused quartz when heated.

Apparently the luminescent properties of quartz do not appear in the quartz crystals of alpha form. If the quartz is heated to a temperature sufficiently high to destroy the beta form of the crystal and thus to prevent the alpha form from appearing upon cooling of the crystal, the quartz then shows luminescent properties. It is very possible that the quartz in the beta form would exhibit fluorescence, but further work is necessary to establish the supposition.

It is also observed that pyrex is weakly thermoluminescent after being irradiated with ultra violet light. Fluorite and calcite are strongly thermoluminescent even from the absorption of ordinary daylight.

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THE TOXIC EFFECT OF ULTRA VIOLET RADIATIONS UPON YEAST AND YEAST-GROWING MEDIA

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We have not found in our work any region of ultra violet energy which will produce a stimulation of yeast growth in any synthetic medium used. In every case the action of the ultra violet radiations has produced a toxicity in the media in proportion to the amount of ultra violet received. Even fifteen minutes of ultra violet light at 16 cm. from the lamp produced such a toxicity in the