This, therefore, signifies isotropy of both components for the resonant radiation in accordance with the abovementioned work of Devons and Hine and McDaniel and Stearns.

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Phosphorescent Effects with High Energy Radiation*

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(Received April 26, 1951)

THE fluorescence and phosphorescence of sodium chloride crystals have previously been investigated by Glasser and Beaseley[1,2] and Mandeville and Albrecht.[3] The very interesting observations of Glasser and Beaseley on phosphorescence and light stimulation have been extended and investigated more quantitatively. Our investigations have been conducted on NaCl crystals activated with 1 percent AgCl provided for us by the courtesy of the Harshaw Chemical Company. An essential difference between our crystals and theirs may be a much greater light efficiency, since under gamma-irradiation our activated crystals were as efficient as anthracene in our standard integrating intensity arrangement with the 1P28 photomultiplier,[4] and since after light stimulation they are easily visible to dark adapted eyes after first being subjected to sufficient high energy radiation.

(1) Under gamma-irradiation the crystal does not reach its maximum light intensity at once, but the fluorescent intensity shows a slow increase of about 25 percent in one hour and then remains essentially at a steady value. The emission spectrum obtained for gamma-excitation consists of 2 bands: one in the ultraviolet from about 2350–2600A and another from about 3200–4500A.

(2) Upon removal of the gamma-source, the luminescence of the crystal drops immediately to about 1/4 to 1/2 of the original intensity and then decays rather slowly. This immediate drop and the following decay diminish with increasing total of gamma-irradiation (doses). With a dose of 60 roentgens, for example, after two days, more than 5 percent of the original fluorescent intensity still remained.

(3) Irradiating the crystals with visible or near ultraviolet light (about 3600A) produced no luminescence if the crystals were not first exposed to high energy radiation. However, if the crystals are first excited by high energy radiation and then exposed to visible or near ultraviolet light (light stimulation), a tremendous increase in luminescent light output is observed; this is the case even after the original high energy induced luminescence has decayed to a very low level.

(4) The luminescent output, for the same amount of near ultraviolet radiation, was found to be roughly proportional to the total amount of gamma-excitation (doses) received by the crystal.

(5) A variation of the rate of excitation by a factor of 100 for a total gamma-excitation of 1 roentgen produced no difference in luminescent output after ultraviolet irradiation of one minute.

(6) A dose of 10 milliroentgens could easily be detected by light stimulation within one hour after gamma-irradiation and was still barely detectable after one day.

(7) A dose of 1 roentgen could be detected visibly with dark-adapted eyes and an ultraviolet intensifying screen. Only about a quarter of the total emitted light is visible.

(8) After a dose of about 500 roentgens over 20 hours of irradiation, stimulation by a tungsten lamp produced a light intensity 450 times larger than the original light intensity after the immediate drop in intensity. The stimulation was applied one hour after removal of the gamma-source.

(9) The light-stimulated luminescence also decays slowly and amounts to about 10 percent after 5 minutes; it does not seem to depend on the gamma-dose. It is faster than the phosphorescence decay after direct excitation by high energy radiation, especially when high gamma-doses are applied.

(10) Under continuous light stimulation, with wavelengths up to about 7500A, the luminescent intensity rises, goes through a maximum, and then slowly decays depending on the strength and spectral distribution of the stimulating light. Most effective light stimulation occurs around 3600A. A certain difficulty in removing the last traces of gamma-excitation exists. Strong and extended light irradiation must be applied.

(11) Light stimulation can be applied intermittently with ever-decreasing amplitudes of luminescence.

(12) The process of luminescent stimulation by light can be initiated after delays of three days and very likely much longer. The intensities obtained after such long delays with strong excitation were essentially the same as after short delays.

(13) Excitation with alpha-particles similarly gave a large luminescent output. The decay was, however, considerably faster after the removal of the exciting alpha-source than after gamma-irradiation. After use of a 5-millicurie alpha-source, there was an almost immediate drop to about 10 percent of the original value and then a further drop in 10 minutes of 85 percent. The light stimulating effect after alphas was not as high as that after gamma-irradiation, probably as a consequence of the alpha-particle irradiation being a surface effect and causing an increased density of excitation.

(14) Under fast electron bombardment strong phosphorescence was also observed. The effects were very similar to those after gamma-irradiation. Three days after the removal of the beta-source, the intensity was still several percent of the original decay luminescence. If after this length of time the crystal was irradiated with light, the intensity was of the same order as the initial luminescence.

These properties make activated NaCl crystals very suitable for detection of all types of high energy radiation. Experiments with cosmic rays were not yet conclusive, since crystals which were completely de-excited show a small increase in luminescence after being in darkness for several days. Whether this effect is due to cosmic rays or to a natural recovery of the crystal has not been yet ascertained.

A rough estimate of the amount of stored energy that can be expelled by light stimulation shows that about 20 percent of the total energy which can be emitted as light is stored and can be released by the light stimulation.

* This work was supported by the Signal Corps Engineering Laboratories, Fort Monmouth, New Jersey, Contract No. DA36-039sc-5487.
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Pressure-Induced Absorption in Hydrogen

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CRAWFORD, *et al.*[1–3] observed in compressed hydrogen and hydrogen foreign gas mixtures an absorption at the frequency of the usually forbidden 0—1 vibrational band of hydrogen. From the pressure dependence of this absorption they concluded that molecular distortions induced during binary collisions are responsible for this pressure activation of the vibrational band. Detailed calculations have now been made of this pressure-induced absorption in H_2. It is assumed that the absorption coefficient may be obtained by first calculating the absorption due to one interacting pair of molecules (1 and 2) at