function of angle θ. These values were derived from a smooth curve drawn through the actual experimental points. As reported here, the data are believed to be correct to within about six percent.

Comparison of our data with the theoretical cross sections of Buckingham and Massey[2] for the energy of our experiment indicates that while agreement is reasonable over a large range of angles considerable departures set in at large angles, the experimental cross sections being much larger than the theoretical beyond about 140°.

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‡ Now associated with the Los Alamos Scientific Laboratory, Los Alamos, New Mexico.
[1] Bondelid, Bohlman, and Mather, Phys. Rev. 76, 865 (1949).
[2] As yet unpublished. This work is an extension of the $n-d$ scattering theory by Buckingham and Massey. We are indebted to Professor Massey for communicating his data to us.

Absorption Bands and Luminescence of LiF Irradiated at Low Temperature

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WHEN LiF crystals are exposed at liquid N_2 temperature to x-rays or 1-Mev electron bombardment, in addition to the F-band with peak at 2420A, a band with peak at 3400A is produced in the absorption spectrum. After relatively short exposure to the primary irradiation the peaks of the two bands are of nearly the same height, while the band at 3400A is about twice as wide as the F-band (1.2 ev instead of 0.65 ev at $-195°C$). With increasing exposure to the primary irradiation, the band at 3400A seems to approach saturation value while the peak of the F-band continues to grow.[1] When the crystal is warmed up from $-195°$ to $-135°C$ and is kept at this temperature, the band at 3400A disappears from the spectrum, while the F-band does not lose more than 50 percent of its initial intensity even when the crystal is warmed to room temperature. By irradiating the crystal at $-195°C$ with light of wave-length 3650A the band at 3400 is almost completely bleached out without change in the F-band (Fig. 1).

The warming up of the samples from $-195°$ to $-100°C$ is accompanied by the emission of a blue luminescence exhibiting in its "glow curve" a single peak at $-135°C$ (Fig. 2) as has been stated also by Ghormley.[2] The end of this luminescence emission coincides with the disappearance of the band at 3400A in the absorption spectrum. If this band is bleached out by irradiation with light of wave-length 3650A before the warming-up process, the shape of the glow curve remains unchanged, but the total light sum is reduced to about 12 percent of its former value. The behavior is not altered if the bleaching light is filtered through a Pyrex glass transmitting the radiation of a high pressure Hg arc down to 3000A. If the filter is replaced, however, by another transmitting some light of wave-lengths down to 2900A the light sum in the
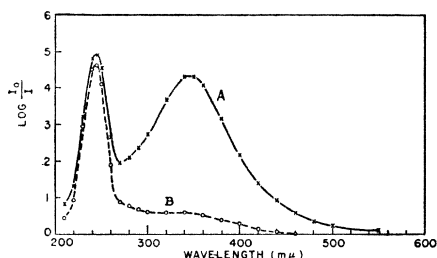

FIG. 1. Absorption spectrum at liquid N_2 temperature of LiF-crystals exposed to x-rays for 15 min. at liquid N_2 temperature. Curve A: without further treatment. Curve B: after bleaching 1 hour at liquid N_2 temperature with 3650A light.
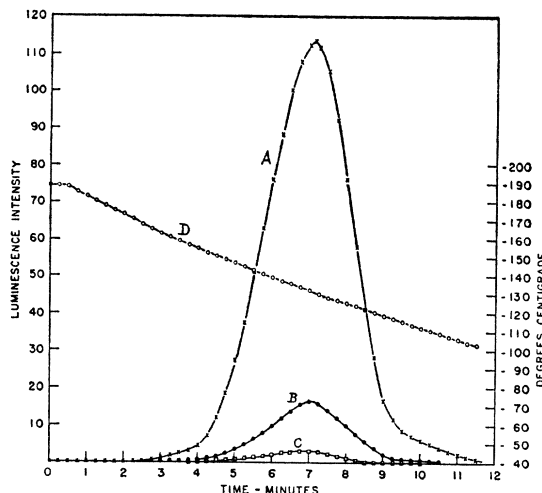

FIG. 2. Glow curves of LiF crystals exposed to x-rays for 15 min. at liquid N_2 temperature. Curve A: without further treatment. Curve B: bleached 1 hour with 3650A light from AN-6 Hg-arc. Curve C: bleached 20 min. with light from AN-6 Hg-arc transmitted through 2.6-mm Pyrex glass. Curve D: temperature *versus* time.

glow curve is cut down to about 1 or 2 percent (curves 2 and 3 in Fig. 1), while the peak of the F-band is only slightly affected. Thus it is proved that the energy for the "thermoluminescence" in the temperature range from -190 to $-100°C$ is not provided in the main by the disappearance of F-centers, but is intimately related to the disappearance of the hitherto unknown band at 3400A. There is good reason, however, to believe that the absorption with peak at 3400A is not due to a single band but to the superposition of at least two bands.

When, after warming up to room temperature, the band at 3400A of a heavily bombarded crystal has completely disappeared, the crystal slowly acquires a deep blue color due to the formation of a new band with peak at 6200A which is quite stable at $-195°C$. At room temperature, however, this band gives way to a narrow band with peak at 4450A so that the color of the crystal changes from blue through green to yellow. When this stage is reached no further changes occur in the optical properties of the crystal even when it is kept in full daylight at room temperature for several weeks.[3]

[1] Casler, Pringsheim, and Yuster, Argonne National Laboratory, 3rd Quarterly Report (1949), ANL-4380 (pertinent material unclassified).
[2] J. A. Ghormley, Oak Ridge National Laboratory, 3rd Quarterly Report (1949), ORNL-499.
[3] R. Casler and P. Pringsheim, Argonne National Laboratory, 1st Quarterly Report (1948), ANL-4204 (pertinent material unclassified).

Microwave Absorption Spectra of POF$_3$*,†

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THE lowest rotational transition of the POF$_3$ rotational spectrum ($J=0\rightarrow1$, $K=0$, $v=0$) has been observed in Stark fields as high as 9.26 e.s.u. With these high fields, the line is shifted 330 Mc/sec. No departure from the expected quadratic Stark law has been observed with these high fields. The line frequency may be given by the expression

$$\nu=9186.99(\pm0.04)+3.507E^2(\text{Mc/sec.}),$$

where the applied electric field is given in e.s.u. This yields a B_0 value of 4593.50 ± 0.02 Mc/sec. and a dipole moment of 1.735 Debye units. The uncertainty in the Stark electrode spacing contributes the overwhelming portion of the probable error in the