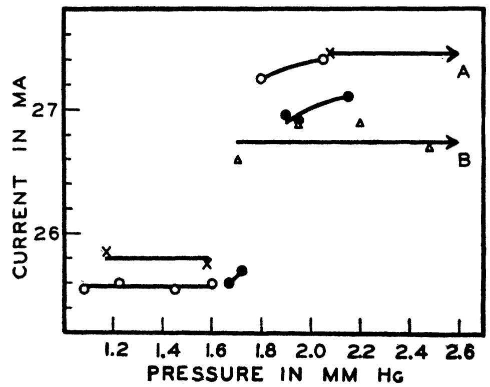

FIG. 2. Tube current as a function of gas pressure. Other data (not shown) indicate that curves A and B extend, at constant current, to 9-mm Hg and 4-mm Hg, respectively.

whiter. This abrupt change occurred in addition to the gradual change to a whiter discharge (as pressure is decreased) which takes place at higher gas pressures. The latter is probably due to the relatively late saturation of the intensity-pressure curve for the strong yellow line at 5875A. The abrupt change may likewise be connected with this line since the blackening-pressure curve has a large slope in this region (Fig. 1).

The large current change at about 1.7-mm Hg may account for the large change in sputtering rate, since sputtering increases with voltage.[7] The voltage increase, corresponding to the current decrease (negative linear current-voltage characteristic), was observed to be as abrupt as the latter. The determination of this critical gas pressure can be used to ascertain both operating and sealing-off pressures of high intensity, low pressure discharges where the sputtering rate must be small.

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On the Measurement of the Energy of Fast Neutrons by Photographic Emulsions Loaded with Enriched Li^6

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IN the literature[1] it is suggested that Li^6 disintegrations in photographic emulsions be used to measure the energy of fast neutrons. In commercial lithium loaded plates the disintegrations are masked by a high background of proton tracks. To overcome this Roberts[2] suggested the use of emulsions heavily loaded with enriched Li^6. This isotope with an enrichment factor of about 98 percent was supplied to the Los Alamos Scientific Laboratory by the Carbide and Carbon Chemical Corporation of Oak Ridge, Tennessee. The Eastman Kodak Company impregnated the enriched Li^6 into NTA type emulsions.

Some of these plates have been bombarded with neutrons from a mixed Po+Be source at the Argonne National Laboratory. Figure 1 shows a disintegration produced by a neutron from this source.

About 225 tracks produced by thermal neutrons from the thermal column of the heavy water pile at the Argonne National Laboratory were measured giving $R_\alpha=6.8\pm0.6\mu$ and $R_T=38.2\pm1.1\mu$. An analysis of the method indicates that it can be used to measure neutrons of energy less than one Mev to a precision of at least ±0.1 Mev; preliminary measurements with monoenergetic neutrons confirm this. Such resolution is obtained as follows:

For a given neutron energy and angle θ between the alpha-particle and triton there are in each disintegration two possible triton energies. Select those disintegrations for which the triton has the greater energy. The disintegrations so selected must now be considered individually according to the value of the angle θ. As θ decreases from 180° to its limiting value, the neutron energy becomes an increasingly sensitive function of θ. Thus for tracks with θ greater than say 170° the neutron energy can be determined from an accurate measurement of the sum of ranges of the two particles and a rough determination of the angle. For tracks with successively smaller θ values it is necessary to determine θ with increased accuracy in order to obtain the neutron energy with the same precision. The method is being tested at Northwestern to measure the energy of neutrons from a thin beryllium target bombarded with polonium alpha-particles.

The Li^6 technique will extend the photographic method to neutron energies below one Mev. It is particularly suited to the

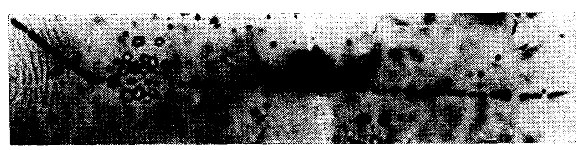

FIG. 1. Li^6 disintegration by a neutron from a mixed Po+Be source. $R_\alpha=17.5\mu$, $R_T=86.2\mu$, and $\theta=149°$. Approximate range energy curves and $Q=4.64$ Mev give a neutron energy of 4.6 Mev.

measurement of the energy distribution of fast neutrons inside a material medium since collimation of the neutrons is not required and perturbations introduced by the detector are minimized.

The results of this study of the method together with some specific applications will be published in detail at a later date.

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The Effect of Alpha-particles on a Superconductor*

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SUPERCONDUCTING bolometers have been bombarded with alpha-particles from a polonium source, and it is found that countable electrical pulses are produced, one for each particle impact. The bolometer used in the experiment reported here was made of a strip of columbium nitride, approximately $3.5\times0.4\times0.006$ mm, mounted with bakelite lacquer on a copper base, and maintained at the operating temperature of 15.5°K in a cryostat, as previously described;[1] its time constant was about 10^{-3} sec.

To provide a mounting for the polonium source, a glass tube *ca.* 30 cm long and 3 cm diameter was sealed to the cryostat nose facing the bolometer. The source could be slid back and forth in this tube, placing it at distances from the bolometer ranging from 2 cm to 20 cm.

The source consisted of polonium on a nickel disk 1 cm diameter, attached to the face of a steel cylinder. A vacuum of better than 10^{-6} cm was maintained in the source tube and around the bolometer by a charcoal trap at liquid nitrogen temperature aided by the many contiguous surfaces at 15°K, so that the α-particles traveled from the source to the bolometer with no significant loss

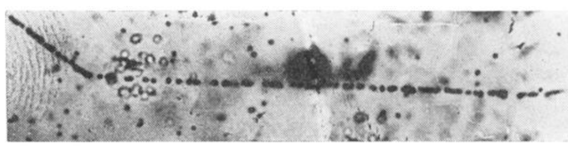

FIG. 1. Li^6 disintegration by a neutron from a mixed Po+Be source. $R_\alpha=17.5\mu$, $R_T=86.2\mu$, and $\theta=149°$. Approximate range energy curves and $Q=4.64$ Mev give a neutron energy of 4.6 Mev.