TABLE I. Comparison of fluorescence for various excitations.

Substance	Intensity α particles[a]	β particles[b]	γ rays[c]
Anthracene crystal	4.3	44	71
Anthracene powder	2.5	41	61
Calcium tungstate	3.3	47	46
Diphenyl	1.1	14	22
Radelin (PFG)[d]	30	47	42
Terphenyl (3 g/l) in phenylcyclohexane	...	20	...
ZnS (Type D)	100	100	100

[a] Polonium source.
[b] Strontium 90; values corrected for equal stopping power.
[c] Radium; values corrected for equal mass.
[d] Radelin is also a ZnS-type phosphor.

single crystal (specially purified). Special precautions were taken with the ZnS powders to attain saturation before measurements, and thus maximum light efficiency was obtained.

The crystal values provide the most favorable comparison for the true anthracene fluorescence with that of ZnS. Anthracene of different degrees of purity were found to have practically the same yield, though anthracene powder with just a noticeable yellow color due to oxidation had a light intensity of only 60 percent of that of the pure material. The difference between gamma-ray and beta-particle values for substances like anthracene and $CaWO_4$ may be due to the portion of electrons with smaller energy than the maximum and, therefore, higher energizing power for which the light efficiency is smaller.

The liquid also showed no self-absorption and demonstrated a high efficiency for beta particles. (Its high efficiency for gamma rays was previously determined.[5]) If corrected for zero self-quenching, this efficiency is only 30 percent smaller than that of solid anthracene.

If the absolute yield for ZnS is assumed to be 20 to 25 percent,[1,4] these results show that the absolute yield for anthracene lies between 8 and 10 percent as previously reported. The occurrence of only a small difference between the crystal and powder values for electrons and gamma radiations again shows the very slight absorption even in the powder.

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A Metastable State of V^{52}

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VANADIUM is found to have two stable isotopes,[1] V^{50} and V^{51}. After neutron bombardment of vanadium, Amaldi *et al.*[2] found an activity with a 3.75-min half-life. Later Renard[3] reported a 2.6-min state which he ascribed to V^{52}. Cork *et al.*[4] found a half-life of 16 hours.

Spectroscopically pure V_2O_5 was irradiated in the JENER-pile for approximately 30 hours. The half-life was measured and the 16-hour activity was verified.

In order to identify the 16-hour activity, the gamma spectrum was measured with a scintillation spectrometer. Two gamma rays with energies of 59 kev and 96 kev were obtained. Further, eight other lines were detected:

0.539±0.008 Mev,	1.40±0.04 Mev,
0.739±0.010 Mev,	1.76±0.07 Mev,
0.850±0.010 Mev,	2.33±0.07 Mev,
1.00 ±0.06 Mev,	3.2 ±0.1 Mev.

The three lines 0.739 Mev, 1.00 Mev, and 1.40 Mev have been reported[5] for Cr^{52}. The other five also fit the disintegration scheme of Cr^{52}. Since the vanadium isotope investigated is a negatron-emitter and thus goes over into Cr, and because the lines detected seem to agree with those of Cr^{52} obtained from the positron-emitter Mn^{52}, it seems probable that the 16-hour activity belongs to an excited state of V^{52}. Thus the low-energy lines probably belong to excited states of V^{52}, the highest level of which has a lifetime of 16 hours and the lower one 3.7 minutes.[3]

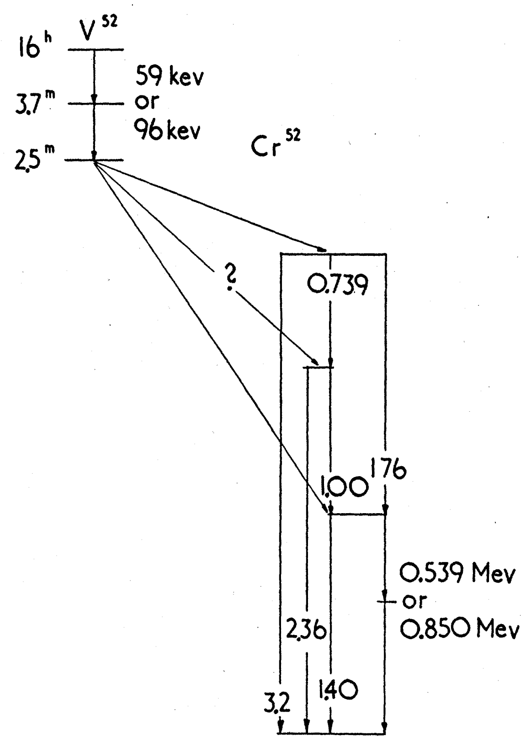

FIG. 1. Tentative decay scheme of V^{52}.

The new high-energy lines detected in Cr^{52} make it possible to give the order of the γ rays with energies 0.74 Mev and 1.0 Mev (Fig. 1).

The investigation of vanadium will continue.

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Total Cross Sections of 408-Mev Protons for Hydrogen and Light Elements*

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THE total cross sections of several light elements for 408-Mev protons have been measured by a transmission method. The cross sections given here were measured in such a way that they include all processes except the Coulomb scattering. A proton beam scattered from the Chicago 170-inch synchrocyclotron was highly collimated and deflected with an auxiliary magnet. Range measurements in copper indicated a mean proton energy of 408±10 Mev at the scatterer.

Two one-inch square×$\frac{1}{4}$-inch thick crystal scintillation counters were connected in fast coincidence to define and monitor the beam. A $9\frac{1}{2}$-inch diameter liquid scintillator counter was placed coaxial with the beam defined by the first two counters and at variable