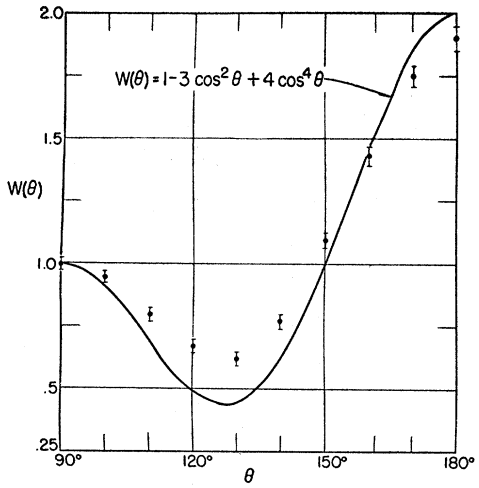

FIG. 1. Angular correlation of the 513- and 624-kev gamma-ray cascade in Pd^{106} (not corrected for finite solid angles).

with the decay scheme proposed by Alburger.[2] In preliminary runs the coincidence rate for the main cascade was observed as a function of angle in 10° increments from 90° to 180°, one spectrometer detecting the 513-kev photopeak, the other detecting the 624-kev photopeak. As shown in Fig. 1, the data follow closely the curve for Brady and Deutsch's conjectured spin assignments.

To check the agreement with this assignment some 40,000 counts were collected at 90°, 135°, and 180°. Various pulse-height spreads were tried, most of the data being taken with each spectrometer set to cover both photopeaks. The background was determined by introducing a 0.5-microsecond delay in one of the channels of the coincidence circuit. A typical set of runs corrected for the random background (0.160 counts/second) is shown in Table I. The average of the three entries at each angle represents some 12,000 counts. The correction for the 1024–513 kev cascade was determined by setting one spectrometer on the 513 photopeak and the other on the 1045 Compton distribution just above the 624 photopeak. A further 1 percent increase was attained by correcting for the counter solid angles. The ratio is rather insensitive to this geometric effect since $W(\theta)$ has a peak at both 90° and at 180°.

When the spectrometers were set to count all pulses above a certain height (integral), the ratio dropped, the decrease being greater the lower the integral setting. For example, counting all pulses above 300 kev, the observed ratio was 1.67. These decreases are explained partly though not completely by the calculated interference from the 1045–513 cascade. This suggests that the lack of energy resolution in earlier experiments is one of the main causes of the previous disagreement with the theoretical correlation function.

The corrected value of the 180°–90° ratio, 1.91 (with a possible 2 percent statistical error) is still some 4 or 5 percent less than the predicted ratio. This could be accounted for by a hyperfine coupling to the intermediate nuclear state. The necessary effect is within the limits of error Steffen[3] assigned to his experiment in the investigation of the effects of various sources. There is also the possibility of a small amount of interfering radiation.

TABLE I. Three determinations are given of the counting rates (corrected for background) of the 513-kev gamma-ray in coincidence with either the 624-kev or the 1045-kev gamma-ray. From their averages the separately determined 1045–513 counting rates are subtracted, yielding in the last line the coincidence rates for the 624–513 cascade alone.

Cascade	Counts/sec 180°	90°	$W(180°)/W(90°)$
624–513	1.272	0.688	1.85
+	1.245	0.673	1.85
1045–513	1.267	0.680	1.86
Average	1.261	0.680	1.85
1045–513	0.043	0.035	
624–513	1.218	0.645	1.89

Taking further advantage of the energy resolution of the scintillation spectrometers, the coincidence rate of the 1045-513 kev cascade was observed at 90°, 135°, and 180°. The data were reasonably consistent with the assignment of spin 2 to the 1.55-Mev level, the 1045-kev gamma being a mixture with β/α about 2 or 3, $\delta = 180°$ in the Ling-Falkoff[4] notation. The observed positive coefficient of the $\cos^4\theta$ term excludes the assignment of spin 1 or 3 for any possible dipole-quadrupole mixture. This confirms Alburger's suggestion[2] for the spin of the upper state.

[1] E. L. Brady and M. Deutsch, Phys. Rev. **74**, 1541 (1948); **78**, 558 (1950).
[2] D. E. Alburger, Phys. Rev. **85**, 700 (1952); Brookhaven Quarterly Progress Report No. BNL-132 (1951).
[3] R. M. Steffen, Bull. Am. Phys. Soc. **27**, No. 1, 57 (1952).
[4] D. S. Ling and D. L. Falkoff, Phys. Rev. **76**, 1639 (1949).

Helium II Transfer Rates on Lucite and Perspex Surfaces

B. S. CHANDRASEKHAR
Clarendon Laboratory, Oxford, England
(Received March 19, 1952)

DASH and Boorse[1] recently reported the curious dependence on temperature of the helium II transfer rate on Lucite, showing a sharp maximum at 1.5°K. It seemed of interest to look for a similar effect with Perspex, which, like Lucite, is a methyl methacrylate polymer. Experiments have now been done on the flow of beakers of both Perspex and Lucite (see Fig. 1).

The flow rate *versus* temperature curve for Perspex shows a striking dependence on the method used for polishing. Microscopic

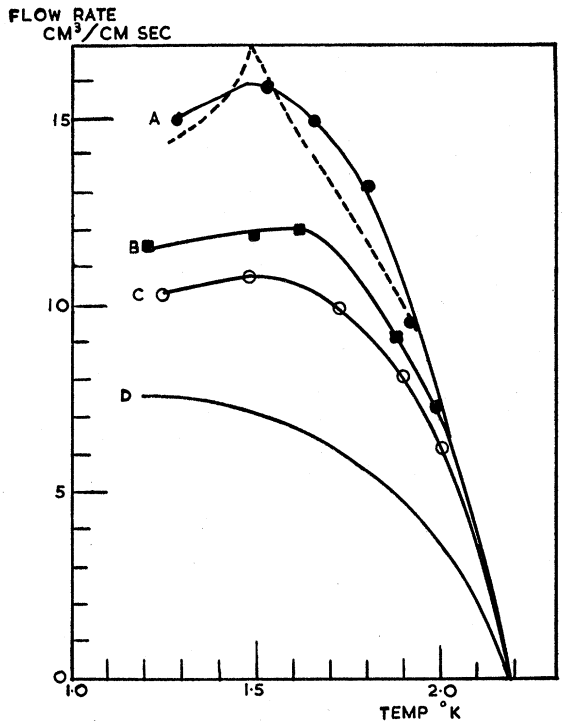

FIG. 1. The broken curve shows the results of Dash and Boorse for Lucite. Curve *A* is for Perspex polished with commercial liquid polish, *B* for rouge-polished Lucite, and *C* for rouge-polished Perspex. *D* is the curve for glass btainedo by Mendelssohn and White.

examination of the Perspex surface polished with a commercial liquid polish showed a rough streaky structure with "ridges" and "valleys" about 10^{-3} cm wide, while rouge polishing gave a comparatively smooth surface. The flow rates of curve *A* showed a considerably greater variation along the length of the beaker, than those of curve *C*, for a given temperature. Furthermore, the flow characteristics of rouge-polished Lucite and Perspex are very alike and have flatter maxima and are closer to the characteristic for glass.

These results, taken in conjunction with recent observations on the film flow out of specially polished stainless steel beakers,[2] seem to indicate that the observed flow on Lucite and Perspex can be regarded as being composed of two parts: (1) pure film flow giving a characteristic similar to the one observed on glass[3] (curve *D*); (2) a pressure dependent flow of bulk helium, which takes place when the surface irregularities are of a shape and size favorable to this type of siphon flow. The maxima in the flow characteristics would require this type of flow to decrease with decreasing temperature. It is interesting to note that a similar temperature dependence was observed in the case of flow of helium II through capillaries of about 10^{-2} cm diameter.[4] To verify this explanation, a flow experiment at 2.26°K, just above the λ-point, was done with a "rough" Perspex beaker carefully shielded from radiation, and a very small inflow was indeed observed. This flow was very strongly dependent on the difference of levels of helium outside and inside the beaker, increasing as the outer level was brought nearer the rim of the beaker with the inner level remaining constant. No such flow could be detected at 4.2°K. A detailed communication will appear shortly.

I wish to thank Dr. K. Mendelssohn for his guidance and many valuable discussions.

[1] J. G. Dash and H. A. Boorse, Phys. Rev. **82**, 851 (1951).
[2] B. S. Chandrasekhar and K. Mendelssohn, [to be published in Proc. Phys. Soc. (London)].
[3] K. Mendelssohn and G. K. White, Proc. Phys. Soc. (London) **A63**, 1328 (1950).
[4] J. F. Allen and A. D. Misener, Proc. Roy. Soc. (London) **A172**, 467 (1939).

Radioactivity in Neutron Activated Platinum

J. M. Cork, J. M. LeBlanc, F. B. Stumpf, and W. H. Nester
Department of Physics, University of Michigan, Ann Arbor, Michigan
(Received March 17, 1952)

In a previous report[1] some twenty-two electron conversion lines were noted from platinum irradiated in the pile. Since the spectrometric exposure was begun many hours after the end of the irradiation and only one spectrogram could be obtained from each specimen, it was naïvely concluded that all of the observed activity was associated with the 3.4-day decay of gold 199, formed from platinum 198. With stronger irradiated sources and shorter transit times, it becomes possible to make chemical separations and to obtain a sequence of exposures showing the different rates of decay for certain electron lines as shown in Fig. 1. It is apparent that lines characteristic of the 17.4-hour Pt^{197} activity are present. This electron group with work functions characteristic of gold, indicates the existence of two gamma-rays of energies 77.4 and 191.2 kev, as recently found in the *K*-capture decay of Hg^{197}. A chemical separation of gold from the platinum yields the electron lines shown in the bottom spectrogram of Fig. 1. The energies of the three gamma-rays, 49.8, 158.5, and 208.3 kev, agree well with values recently reported[2] by Hill.

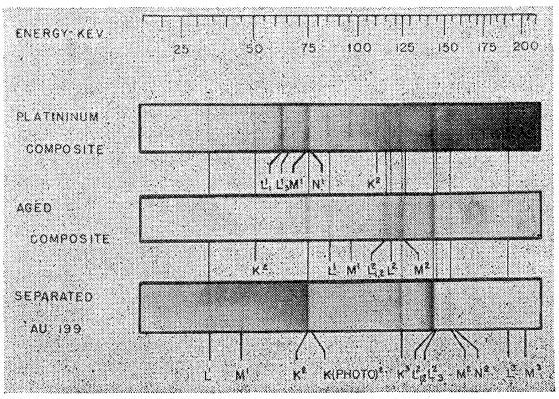

FIG. 1. Electron lines from freshly activated and aged platinum and separated gold.

TABLE I. Electron energies for composite platinum.

Electron energy	Interpretation	Energy sum	Electron energy	Interpretation	Energy sum
34.9 kev	*L* Hg	49.7 kev	110.5 kev	*K* Au	191.2 kev
46.3	*M* Hg	49.8	115.8	$L_{1,2}$ Pt	129.7
51.6	*K* Pt	130.0	118.2	L_3 Pt	129.8
53.2	Auger		125.3	*K* Hg	208.4
63.0	$L_{1,2}$ Au	77.4	126.9	*M* Pt	130.2
65.3	L_3 Au	77.2	129.1	*N* Pt	129.8
74.0	*M* Au	77.4	129.8	Photo *K* Pt	208.2
75.4	*K* Hg	158.5	144.3	$L_{1,2}$ Hg	158.5
76.8	*N* Au	77.6	146.4	L_3 Hg	158.7
77.8	Photo *K* Au	158.5	155.2	*M* Hg	158.7
80.2	Photo *K* Pt	158.6	157.7	*N* Hg	158.5
85.0	*L* Pt	98.9	193.4	*L* Hg	208.2
96.0	*M* Pt	99.3	204.6	*M* Hg	208.1

TABLE II. Gamma-energies.

Emitting isotope	Gamma energy, kev	*K*/*L* ratio
Au^{199}	49.8	
3.4-day	158.5	0.56; (*L*/*M*) 3.6
	208.3	4.5
Pt^{197}	77.4	
17.4-hour	191.2	6.0
Pt^{195m}	99.1	
4.4-day	129.8	0.1

Certain of the electron lines fall in neither of these groups and are associated with some other platinum activity. They decay with a half-life of the order of 4 days and appear to be satisfied by the work functions of platinum. It is, therefore, quite probable that no 4.4-day radioactivity exists in platinum 193 as had been assumed, but rather that an isomeric state exists, probably in platinum 195, since this mass could equally well satisfy every criterion used[3] in making the previous assignment. The gamma-energies of 99.1 and 129.8 kev are identical in value with those observed[4] after the beta-decay of a 180-day activity believed to be in Au^{195}. The relative intensity of the two gamma-rays, here found to be about equal, is quite different from that reported for the gold. This might be expected since in the latter case the beta-emission is complex so that about 90 percent of the beta-decays yield no 129.8-kev gamma-ray.

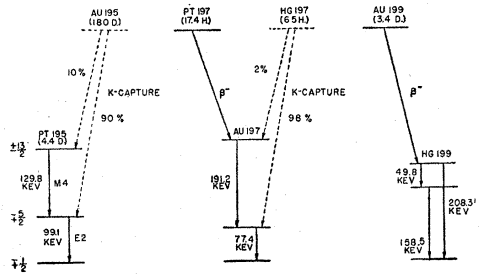

FIG. 2. Proposed nuclear levels in Pt^{195}, Au^{197}, and Hg^{199}.