long and short range alpha-particles is thus a reasonable one. The fact that the gamma-ray yields are larger, and, near the 330-kev resonance, much larger than the yield of long range alpha-particles, makes it necessary to assume that, at least for this γ-ray resonance, the long range alpha-emission is either forbidden or reduced.

If then the excited state is even, we should expect the resonance yield of long range alpha-particles to be comparable with, and probably considerably greater than the yield of pairs. If this is not so, the pair emission itself would seem to provide strong evidence for a nonelectromagnetic coupling between electrons and heavy particles.

J. R. OPPENHEIMER
J. S. SCHWINGER*

University of California,
Berkeley, California,
October 29, 1939.

* National Research Fellow.
[1] W. A. Fowler and C. C. Lauritsen, Phys. Rev. **56**, 840 (1939).

Observation of the Spectrum of Ne V

Previous investigations of the spectra of rare gases[1] have been limited in the extent of ionization which was produced in the gas atom. The development of methods of study of atoms which can be fixed in an electrode in solid form has extended the spectra of such ions to far greater stages of ionization. In an attempt to close some of the gaps in isoelectronic sequence data, experiments have been undertaken to determine whether higher stages of ionization can be studied in the rare gases. This communication is a preliminary report of some observations of the spectra of neon.

A periodic disruptive discharge in neon gas enclosed in Pyrex and quartz capillaries of about 2 mm bore and 15 mm length has been used as a source of light on a 3-meter grazing incidence vacuum spectrograph. On the resulting spectrograms the principal lines of Ne III, Ne IV, and Ne V have been identified.

The wave-lengths of the lines attributed to Ne V are given in Table I. The identification seems certain inasmuch as the lines are well isolated on the plates and their positions can be predicted with good accuracy from isoelectronic sequence data. The wave-lengths given must be regarded as tentative as they may be in error by as much as 0.05A because of the scarcity of standard lines on the plate from which the measurements were taken.

It is expected that refinements of experimental technique will permit fuller development of the spectrum of Ne V and more accurate wave-length measurements. Since the lines due to Ne V are equally as strong as those due to Ne III and Ne IV on the present plates, it is possible that this method will provide for the excitation of still higher stages of ionization. Experiments are being carried out with argon, krypton and xenon.

TABLE I. *Spectrum lines attributed to* Ne V.

λ VAC.	ν CM^{-1}	TRANSITION
572.38	174,708	$2p^2\,{}^3P_2-2s2p^3\,{}^3D_{2,\,1}{}^0$
572.12	174,787	$2p^2\,{}^3P_2-2s2p^3\,{}^3D_3{}^0$
569.84	175,487	$2p^2\,{}^3P_1-2s2p^3\,{}^3D_{2,\,1}{}^0$
568.45	175,918	$2p^2\,{}^3P_0-2s2p^3\,{}^3D_1{}^0$
483.00	207,039	$2p^2\,{}^3P_2-2s2p^3\,{}^3P_2{}^0$
481.30	207,770	$2p^2\,{}^3P_1-2s2p^3\,{}^3P_{1,\,0}{}^0$
480.38	208,168	$2p^2\,{}^3P_0-2s2p^3\,{}^3P_1{}^0$

FRED W. PAUL

Mendenhall Laboratory,
Ohio State University,
Columbus, Ohio,
October 31, 1939.

[1] J. C. Boyce, Phys. Rev. **46**, 378 (1934); **47**, 718 (1935); **48**, 396 (1935).

Work Functions of Different Faces of Silver Single Crystals

The work functions of the (100) and (111) faces of silver single crystals have been determined by a photoelectric method after extended outgassing of the crystals in a high vacuum. The crystal faces were prepared by a method described previously.[1] The equilibrium value of the work function for the (100) face is 4.81 ± 0.01 electron volts. This value was obtained after 2283 hours of heating at various temperatures up to visible red heat. 356 hours of additional heating did not change this value. After the crystal had subsequently remained at room temperature for 2130 hours, at a pressure of 1 to 3×10^{-8} mm Hg, the work function decreased to 4.65 ev. After 100 hours of additional heating of the crystal the work function increased to 4.79 ev, and after an additional 118 hours of heating it returned to the equilibrium value of 4.81 ev.

The equilibrium value of 4.75 ± 0.01 ev for the (111) face was obtained after 1227 hours of heating at temperatures similar to those above. This crystal had been outgassed in two previous experiments so that a much shorter time was required to reach the equilibrium value of the work function than for the (100) face. The above equilibrium value was not changed by 407 hours of additional heating. At this time the crystal became slightly contaminated while heating a tantalum plate near it. The effect of the contamination was to cause a failure of the experimental results to fit the Fowler theoretical curve.

Measurements of the contact potential difference, by the Kelvin null method, between the two crystal faces at frequent intervals during outgassing agreed with the differences of the photoelectric work functions to within ±0.01 volt until the results for the (111) face failed to fit the Fowler theoretical curve.

We believe that these values are the best that can be obtained by heating since silver crystals etch rapidly, thus exposing other faces, when heated at temperatures where appreciable evaporation occurs.[2] The above values may be compared with 4.74 ev, previously obtained by Winch,[3] for polycrystalline silver after heating for 1200 hours which included short intervals at temperatures as high as 850°C where evaporation is rapid.

H. E. FARNSWORTH

Brown University,
Providence, Rhode Island.

RALPH P. WINCH

Williams College,
Williamstown, Massachusetts,
October 24, 1939.

[1] H. E. Farnsworth, Phys. Rev. **40**, 699 (1932).
[2] A larger preliminary value for contact potential difference was previously reported before sufficient outgassing had been carried out. H. E. Farnsworth, Phys. Rev. **51**, 378 (1937).
[3] Ralph P. Winch, Phys. Rev. **37**, 1269 (1931); R. H. Fowler, **38**, 45 (1931).