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NOTE ON THE ARC SPECTRUM OF ELEMENT 61
CYRUS FELDMAN

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CYRUS FELDMAN

November 24, 1948

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A sample of the chloride of element 61, prepared by Paul Lantz, was examined spectrographically on February 20, 1948. It had been separated from a mixture of uranium fission products by fractionation and concentration on a series of Amberlite IR-1 and Dow X resin columns (1). Detailed accounts on the isolation of milligram amounts of element 61 are to be reported elsewhere by G. W. Parker and P. Lantz of this laboratory.

Once isolated, the material was prepared in the form of approximately 0.05 ml. of an HCl solution. The sample was estimated by radiochemical methods to contain approximately 50 micrograms of element 61 in the form of the 4-year isotope of mass 147. A thin layer of Zapon lacquer was deposited on a flat-topped $1/4$ " diam. high purity graphite electrode; the sample solution was deposited on top of this and dried under an infra-red lamp. This electrode was made the anode of a 220 volt, 9 ampere D.C. arc. A $1/8$ " diameter high purity graphite rod served as cathode. The arc gap was 4 mm. The burning took place inside a chamber which permitted the radiation to enter the spectrograph without allowing the vapor containing element 61, which is highly radioactive, to escape into the laboratory.

The light was focussed on the slit of a 21 foot Jarrel-Ash spectrograph. A first order spectrum (5 \AA/mm) was photographed on two $2" \times 10"$ 103F plates in tandem. No filter was used.

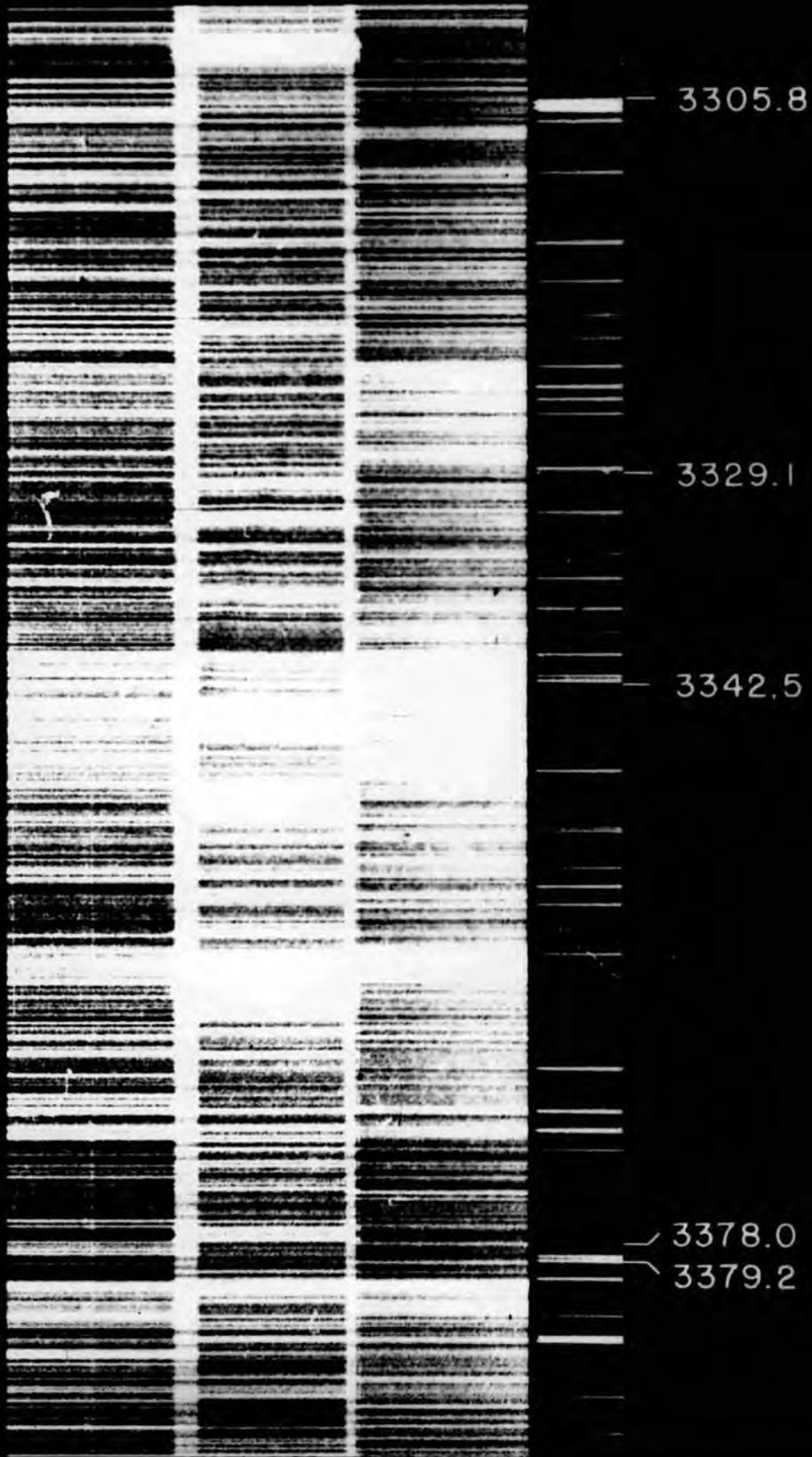
Spectra of Fe, Nd, element 61, and Sm were obtained in juxtaposition in the order mentioned. The placement of the spectra on the plate was effected by means of a Hartmann diaphragm at the slit; the camera was not moved at any time during the exposure.

A search was made for the five lines specifically mentioned by Harris, Yntema and Hopkins (?) as being common to Nd and Sm, and being somewhat more intense in the fractions intermediate between them. Wavelengths

Sm

91

PN



were located by interpolation between Fe lines of known wavelength; observations were made on an ARL-D'etert projection comparator, which gives an enlargement of 21 fold.

The results of the examination were as follows:

<u>λ</u>	<u>Remarks</u>
3305.8	Doubtful
3329.1	Absent
3342.5	Doubtful
3378.0	Absent
3379.2	Absent

The spectrum showed the presence of comparatively large amounts of Ca and Mg, and moderate amounts of Fe, Ni, and Cr.

Although no definite line was seen at 3305.8, the proximity of Fe 3305.98 might mask a weak line at 3305.8. A line was observed at 3342.5, but this line may have been Cr 3342.586.

(See opposite page)

Figure 1. Arc emission spectrum of the 3300 - 3400 Å range. Spectra, from top down: Fe, Nd, 61, Sm. Wavelengths marked are those referred to in text (Enlarged 5X). (Emission lines are black.)

Owing to the well-known difficulty of reproducing complicated spectra, the accompanying figure unfortunately can do little more than give an indication of the complexity of the region.

Because of interference by C₂, CN, and possibly by other bands, it was impossible to establish the presence or absence in this spectrum of the spark lines of element 61 obtained by D. Timma, using the copper-spark technique (3).

References

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- (2) J. A. Harris, L. F. Yntema and B. S. Hopkins, J.A.C.S. 48, 1585 (1926).
- (3) D. Tizma, MonC-166 (U. S. Atomic Energy Commission).

