ENERGY LEVELS AND CLASSIFICATION PROBLEMS IN SPECTRA OF HIGHLY IONIZED ELEMENTS OF THE FIFTH PERIOD

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New Spectra of highly ionized atoms of the fifth period are to be published soon. Selected energy levels obtained with 10^4 A peak current vacuum sparks are presented in Table I.

Among the spectra dealt with are the following:

(1) The isoelectronic sequences of Br I, Kr I, Rb I and Sr I, in the elements Ru, Rh, Pd and Ag. Of special interest are the configurations, isoelectronic with Rb I, $4p^5 4d^2$ and $4p^5 4d5s$ which interact at about the tenth spectrum with $4p^6 5p$ and $4p^6 6p$ respectively.

A triple interaction is observed in sequences isoelectronic with Sr I around the ninth spectrum – the configuration involved are $4p^6 4d4f$, $4p^6 4d5p$ and $4p^5 4d^3$.

(2) The isoelectronic sequence of Rh I in Sn VI, Sb VII, Te VIII and I IX.

A triple interaction is seen around the ninth spectrum and the configurations involved are $4d^8 5p$, $4d^8 4f$ and $4p^5 d^{10}$.

Pure spectrograms of I were obtained, and I V to I VIII are being studied. Three unusually broad lines (Figure 1) are seen at about 140 Å. It is suggested that they belong to transitions of the form $4d^{10}5s^2 - 4d^9 5s^2 5f$, the energy of the last configuration being slightly above the ionization limit.

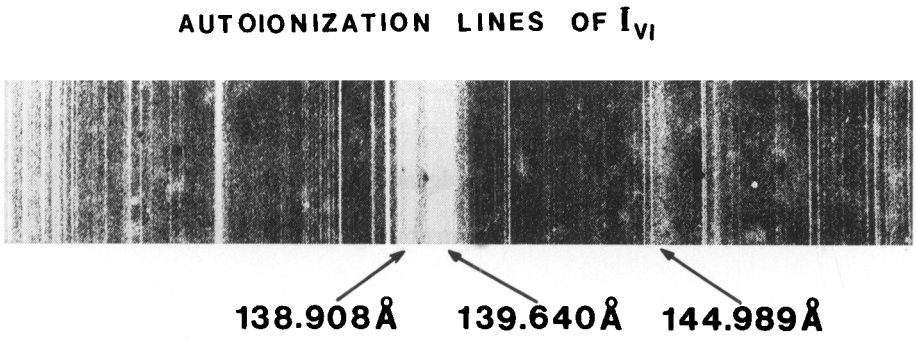

Fig. 1. Broad lines in Iodine.

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TABLE I

Selected Br I isoelectronic sequence energy levels in cm^{-1}

		Ru X	Rh XI	Pd XII
$4s^24p^5$	$^2P3/2$	0	0	0
	$^2P1/2$	33060	38800	45180
$4s^24p^45s$ (3p)	$^4P5/2$	697790	793310	893580
	(^1D) $^2D5/2$	745860	847460	954470

Selected Kr I isoelectronic sequence energy levels in cm^{-1}

	Ru IX	Rh X	Pd XI	Ag XII
$4p^6\,{}^1S_0$–$4p^54d^3P^0_1$	365730	395370	424780	454070
$^3D^0_1$	410380	444560	478750	512980
$^1P^0_1$	501610	542990	584090	625030
Limit	1439000	1673700	1924200	2189500

The splitting of $4d^9$ ($^2D_{3/2}$–$^2D_{5/2}$) in the isoelectronic sequence of Rh I as obtained by Transitions from the $4d^85p$

Configurations (cm^{-1})

Sn VI	Sb VII	Te VIII	I IX
8705	10400	12300	14403

Selected I VII lines

Transition	A	cm^{-1}
$5s^2S_{1/2}$–$6p^2P^0_{3/2}$	261.091	383008
$6p^2P^0_{1/2}$	265.098	377219
$5p^2P^0_{1/2}$–$6s^2S_{1/2}$	433.947	230443
$5p^2P^0_{3/2}$–$6s^2S_{1/2}$	464.135	215454
$5p^2P^0_{1/2}$–$7s^2S_{1/2}$	269.937	370457
$5p^2P^0_{3/2}$–$7s^2S_{1/2}$	281.315	355474
$4f^2F^0_{7/2}$–$5g^2G_{7/2}$	554.875	180221
$4f^2F^0_{7/2}$–$5g^2G_{9/2}$	554.504	180341
$4f^2F^0_{5/2}$–$5g^2G_{7/2}$	550.901	181521

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