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A Description of the Arc and Spark Spectra of Rhenium

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For purposes of chemical identification and of structural analysis, a more complete and accurate description of the atomic emission spectra of rhenium was required. Such a description was obtained by using solid metal electrodes of rhenium in conventional arcs or sparks, photographing the spectra with the aid of large spectrographs containing concave gratings, and measuring the wavelengths of spectral lines relative to secondary standards in the spectrum of iron. Relative intensities were carefully estimated for all lines, and the total widths of many broad lines were measured. Results are presented for approximately 6,000 lines ranging in wavelength from 2000.47 A in the ultraviolet to 11788.9 A in the infrared. A comparison of the estimated intensities in arc and spark spectrograms provides a separation of the spectral lines arising from neutral rhenium atoms from those originating in ionized atoms. In this description the Re I spectrum is represented by about 4,200 lines and the Re II spectrum by nearly 1,800 lines.

1. Introduction

Rhenium is the last stable element to be discovered in the earth's crust. Since its discovery in 1925, rhenium has been found to possess many remarkable properties. For example, its high melting point (3,170° C) is exceeded only by those of carbon and tungsten; its density (20.5) is next to those of osmium, iridium, and platinum. The metal is very hard and can be rolled or drawn only at red heat. Combined with various other metals rhenium forms alloys that are extremely resistant to acids and stable at high temperatures in air. Alloyed with platinum or rhodium and paired with pure platinum, rhodium or palladium, thermocouples are formed that give four times greater thermoelectric forces than the common couples of noble metals, and are stable and useful to nearly 1,900° C. In high vacuum, even at high temperatures, rhenium shows no inclination to sputter and is therefore ideal for filaments of incandescent lamps and vacuum tubes. By depositing rhenium upon metals or glass, optical mirrors of high permanance and reflectance are produced.

The terrestrial abundance of rhenium (0.001 g/ton) is about the same as that of rhodium or iridium, and the current price ($2.00/g) is less than that of platinum and only a third that of iridium. The total annual production of rhenium metal is now only some hundreds of pounds, but its remarkable properties insure increased concentration and extensive future application in science and industry. When this wonder metal becomes common in metallurgy, it will be desirable to have for spectrochemical determination, a satisfactory description of its optical spectra. Furthermore, the spectra of rhenium atoms and ions exhibit some unusual features that lead to interesting information concerning atomic structure, electronic binding forces, and properties of atomic nuclei. To supply descriptions of the arc and spark spectra of rhenium that will be adequate for spectrochemical analysis and for structural analyses of the first two spectra is the purpose of the present paper.

The principal proof of discovery of rhenium by Noddack, Tacke, and Berg [1][1] was the observation of five Röntgen radiations with wavelengths ranging from 1.216 to 1.430 A. The first reference to the optical spectra of rhenium was made in 1928 by Noddack [2], who reported "we know at present several hundred lines which certainly belong to rhenium . . . . The optical last lines of rhenium, especially the triplet at 3640 A permit its identification in concentrations down to 10^{-7}". This first numerical value contains two transposed figures; it should read 3460 A.

In 1931, preliminary data for the arc spectrum of rhenium were published by Meidinger [3], by Schober and Birke [4], and by Meggers [5]. Meidinger [3] observed the spectrum of rhenium powder in a d-c arc between carbon electrodes. The interval between 2600 and 3500 A was photographed with a quartz prism spectrograph and the interval 4040 to 5300 A with a glass prism spectrograph, the reciprocal dispersions for the longer waves being 25 and 30 A/mm, respectively. The wavelengths of 229 lines were given to five figures "for spectrochemical purposes", and intensities of weak, medium, or strong were assigned to the lines.

Schober and Birke [4] reported the wavelengths (3108.94 to 6441.28 A) of 31 strong lines of rhenium on the Rowland scale and stated that 3452.02 (5), 3460.61 (5), and 3464.87 (5) were the last lines to disappear when salt solutions of rhenium were diluted. Schober [6] then published a description of "the arc spectrum of rhenium in the photographic range", giving wavelengths (2391.60 to 6494.15 A) of about 400 lines, and estimated relative intensities (1 to 100). These data were obtained from concave grating spectrograms with reciprocal dispersion of 4 A/mm, the source being a carbon arc with rhenium solution added to the anode. This work was repeated with copper instead of carbon electrodes and reported in three papers [7], which give for more than 2,000 rhenium lines wavelengths ranging from 2405.14 to 7641.20 A, intensities from 1 to 1000, and line

[1] Numbers in brackets refer to literature references at the end of this paper.

widths from 0.1 to 1.0 A. In the region of short waves Schober's lists are a mixture of Re I and Re II spectra without any means of distinguishing them.

A preliminary report on the optical spectra of rhenium by Meggers [5] announced observations of arc and spark spectra, hyperfine structure, and the first atomic energy levels and spectral terms for Re I. More details were given in a paper on the arc spectrum of rhenium [8], which presented 2,200 wavelengths (2500.59 to 8797.6 A), 115 atomic energy levels, and approximately 500 classified lines. Because the data on rhenium spark spectra were less complete, they were withheld. That list of rhenium arc lines, obtained with crystals of pure potassium perrhenate on silver electrodes in a d-c arc, was extended [9] to longer waves (10639.44 A) in 1933, when new infrared sensitive emulsions became available.

A statement in 1931 by Schober [10] that among 60 strong rhenium lines, 24, including the 3 strong ultraviolet lines and 2 green ones, coincide with the Fraunhofer spectrum was contradicted by Moore and Meggers [11], who found that the accordance of solar and laboratory wavelengths of strong rhenium lines does not appear to be exact or real when the hyperfine components of these lines are taken into account. These hyperfine-structure measurements were the first to be reported for rhenium. Almost identical measurements for 3 rhenium lines were independently made by King [12], who observed 19 low-level lines of Re I in a carbon-tube furnace containing metallic rhenium at a temperature near 2,800° C. The striking hyperfine structure of certain rhenium spectral lines was investigated and interpreted by Meggers, King, and Bacher [13], by Gremmer and Ritschl [14], by Sommer and Karlson [15], by Zeeman, Gisolf, and deBruin [16], and finally by Schüler and Korsching [17]; all agreed that the two isotopes of rhenium, with masses 185 and 187, possess nuclear moments of 5/2 $(h/2\pi)$. The last [17] also measured the magnetic moments, electric-quadrupole moment, and isotope shifts characteristic of rhenium isotopes.

Additional measurements of wavelengths in arc and spark spectra of rhenium appear in the MIT Wavelength Tables [18] where data for 2256 lines are given, partly new and the rest quoted from other published tables. Employing the MIT data, Klinkenberg [19] extended the analysis of the Re I spectrum to include approximately 1600 lines as combinations of 221 atomic energy levels. An extension of the Re I analysis was independently made by Velasco [20], but further progress in this direction is greatly handicapped by the inadequacy of the published data for rhenium spectra. The paucity and poor quality of published data for spark lines have frustrated earlier attempts to establish and analyze Re II spectrum of singly ionized rhenium atoms. Except for the paper by Zeeman, Gisolf and deBruin [16], which describes the partially resolved Zeeman patterns of three Re I lines (3452, 3460, 3464 A), no further details of the Zeeman Effect in rhenium have been published. All these deficiencies have recently been removed, and a preliminary announcement of rhenium magnetic splitting factors and of the structure of the Re II spectrum has been made by Meggers, Catalán, and Velasco [21].

In concluding this review of contributions to information regarding the spectra of rhenium, attention is called to the beautiful photograhic charts of arc and spark spectra of rhenium prepared by Gatterer [22]. Six 40 cm prints show prismatic spectra of the rhenium arc from 2156.71 to 6250.75 A, and six similar prints reproduce the prismatic spectra of the rhenium spark from 2091.50 to 6250.75 A. A table accompanying this Atlas gives the wavelengths of 232 of the stronger arc and spark lines of rhenium, with intensities ranging from 1 to 10.

All previous observations of rhenium spectra were made with electric arcs or sparks between either carbon, silver, or copper electrodes to which samples of rhenium were added either in the form of solutions, salts, or metal powder. Under these conditions it is practically impossible to produce complete descriptions of the spectra because bands due to carbon compounds or lines characteristic of silver or copper will mask a certain number of rhenium lines and falsify the wavelengths and intensities of others blended with electrode lines. The present observations of rhenium spectra are justified by the following facts: They were made mainly with solid metallic electrodes of pure rhenium, thus avoiding confusion on account of coincidence with other spectral lines; they were extended to shorter and to longer waves by using new types of photographic emulsions; they were made with generally higher spectrographic dispersion and resolving power than the first observations; and they are based on juxtaposed arc and spark spectra that provide the first useful identifications of Re I and Re II spectra. In short, the present observations have more than doubled the previous number of real rhenium lines and have provided homogenous material of increased accuracy in wavelengths and relative intensities to meet the future needs of spectrochemistry and the search for atomic energy levels as derived from analyses of optical spectra.

2. Experimental Details

Most of the new data for rhenium spectra presented in this paper were obtained from arcs or sparks between electrodes of commercial rhenium metal. The electrodes were made by pressing rhenium metal powder in a Dietert hydraulic press developed especially for compacting metal powders, filings, borings, turnings, etc. into cylindrical rods for spectroscopic electrodes. The cylindrical electrodes were approximately 6 mm in diameter and 10 mm long. These solid cylinders of rhenium were pinched in slotted copper or brass rods, which served as arc or spark electrode holders.

The arc spectra were excited in a d-c arc with an applied potential of 220 v and a current of 6 to 10 amp. The spark spectra were obtained with a high-voltage condensed discharge from mica condensers of 0.006—μf capacity connected to the secondary coil of

a transformer rated at 30,000 v when the primary was connected to the 120-v a-c power line.

All the spectrograms were made with concave diffraction gratings of about 22 ft radius of curvature, mounted to perform stigmatically as described by Meggers and Burns [23]. Three mountings of this Wadsworth type were available, containing respectively 6 in. gratings with 30,000, 15,000, or 7,500 lines/in. The first is used primarily to photograph spectra in the ultraviolet and visible, the second mainly for visible and near infrared, and the third for infrared spectra only. Further information concerning these spectrographs and the photographic plates used with each is given in table 1.

TABLE 1. *Data on spectrographs and photographic plates for recording* Re *spectra*

Spectral region	Grating	Spectral order	Reciprocal dispersion	Photographic plate
A	*Lines/inch*		*A/mm*	
2000 to 2550	30,000	I	2.4	Eastman SWR
2500 to 3500	30,000	II	1.1	Eastman 33
3500 to 4500	30,000	II	0.9	Eastman 33
4400 to 6800	30,000	I	2.2	Eastman II F
6600 to 8800	30,000	I	1.8	Eastman I N
7200 to 9000	20,000	I	3.7	Eastman I R, I P
8600 to 11000	15,000	I	4.8	Eastman I Q
10000 to 12500	7,500	I	10.2	Eastman I Z

In the 1933 observation [9] of the infrared arc spectrum of Re, Eastman plates I R and I P were used with a Rowland grating having 20,000 lines/in., and "Xenocyanine" plates were used with the Anderson grating, 7,500 lines/in. These combinations, it was found, were hard to surpass, and although these spectral ranges were reobserved with other plates and gratings, very little was added to the existing data in those ranges. However, some additional lines of longer wavelength were recorded on I Z plates, which were not available in 1933. The Q and Z plates were hypersensitized immediately before use by bathing them in a 2- to 5-percent solution of ammonia in water. They were then rinsed in alcohol and dried with moving warm air.

The durations of exposure required for recording arc or spark spectra under different conditions were determined by estimation and trial, so that the background continuum imposed the limit. The exposure times for the Re arc ranged from a few seconds in the ultraviolet to 5 hr in the infrared. Likewise, the spark spectra were recorded in times ranging from a few minutes to 2 hr. Between the limits 2000 and 6800 A, the arc and spark spectra of Re were photographed either side by side with iron comparison spectra flanking each or the arc and spark spectra were recorded respectively above and below a center strip showing the iron spectrum with its standard wavelengths.

An effort was made to match the arc and spark spectra, especially in the ultraviolet, so that most of the lines appearing in the arc spectrogram were recorded with almost equal intensity in the spark spectrogram. Under these conditions all lines appearing only, or with greater intensity, in the spark spectrograms may safely be assumed to originate in ionized rhenium atoms, whereas the others belong to neutral atoms. Although some spark lines are enhanced more than others, the stronger ones are generally found also on the arc spectrograms, and there is no good reason to believe that any rhenium lines reported here belong to doubly ionized rhenium atoms.

Because the spark spectra above about 6000 A contained no new or enhanced lines relative to the arc spectra, spark excitation was omitted for waves longer than 6500 A. In photographing the red and infrared spectrum (6500 to 12000 A) the arc was imaged on the spectrograph slits through deep-red glass filters, which transmit only waves longer than 6500 A, and one or two narrow strips of the iron arc spectrum were superimposed to furnish standard wavelengths. These standards were always taken from the same spectral order as the rhenium waves to be measured, except beyond 8800 A to 12000 A, where iron standards were taken from the second or third spectral orders and multiplied respectively by two or three.

The rhenium spectrograms were measured with a large comparator made by the Gaertner Scientific Corporation. The screw has a length of 50 cm and the scales permit direct reading of linear distances to 1μ. Every rhenium spectral line retained in the final list was observed and measured at least twice, and many of them were measured on four or five spectrograms. In all, approximately 20,000 readings of linear distances between images of rhenium and of standard iron lines were recorded and each observation of a rhenium line was accompanied by an estimated intensity. The final values of rhenium wavelengths and relative intensities are averages of the individual observations. When the average deviation of individual values of wavelength from their mean is 0.005 A or less, the final value is given to three decimals, and if the average deviation is greater than 0.005 A, the final value is rounded off to the nearest second decimal.

In reviewing the earlier work on rhenium spectra, reference was made to the hyperfine complexity of some of its lines. When these spectra are observed with high dispersion and resolving power, it is at once obvious that a majority of Re I and Re II lines are more or less wide and complex. Even with the average gratings used in this investigation several dozen rhenium lines were completely resolved, usually into six components, and many hundreds of lines were either partially resolved or shaded to indicate intensity degradation either to shorter (*s*) or to longer (*l*) waves. In most cases, the observed wavelengths of rhenium represent values obtained by bisecting their slit images, except that when the complex line appeared to be more than 0.1 A wide the edges were measured and thus both width and mean wavelength were recorded. In the observed infrared some rhenium lines have widths exceeding 2 angstroms, or 2 wave numbers. The details of rhenium hyperfine structure are omitted here because they are not accurate enough for nuclear physics and are not of vital importance either in industrial

spectrochemistry or in structural analysis of these spectra.

It may be remarked, however, that because of the relatively coarse hyperfine structure in the strongest spectral lines of rhenium, the sensitivity of spectral detection is low compared with that of otherwise comparable metals having narrower lines. A complication for spectrum analysis arises from the fact that many rhenium lines appear to have hyperfine structures deviating from the usual "flag pattern" of regular decrement of spacing and intensity. It is often difficult to decide if close pairs or irregular groups of rhenium lines are in fact separate lines or components of complex lines. Some of these doubts may be resolved in establishing further atomic energy levels of rhenium from analyses of optical spectra without regard to hyperfine structure.

The conspicuous hyperfine structures in rhenium spectra not only complicate the determination of wavelengths but also affect the estimation of relative intensities of the lines. Usually such estimated relative intensities depend on the widths as well as the densities of the photographic images, and when the widths are greatly increased by hyperfine structure, there is a tendency to overestimate intensities. In the present work a conscious effort was made to discount the contribution of hyperfine width to intensity, but it may not be entirely eliminated.

A final difficulty in describing the arc and spark spectra of rhenium arises from a strong background that is continuous throughout the spectrum on fully exposed spectrograms, and in the visible and infrared regions has superimposed on it the coarse rotation structure of molecular spectra, presumably of rhenium oxide. This background imposes a limit on the detection of faint lines, and the molecular lines are often blended with the atomic lines. The molecular lines were not intentionally measured, but band heads were included when they were obvious or unmistakable; these are marked *B* in the list of lines.

3. Results

The results of this investigation are presented in table 2, where the measured wavelengths (in angstroms) of rhenium spectral lines (column 1) are followed by estimated relative intensities in arc and spark spectra. The intensity numbers range from 1 to 10000; they are accompanied in many cases by letters and other numbers. The letters accompanying intensities impart additional information concerning the lines; they have the meaning adopted by the International Astronomical Union [24] in a proposed notation for the description of spectral lines as follows: *B*, band head; *c*, complex (narrow fine structure, isotopic or nuclear-spin hyperfine structure); *d*, unresolved double (approximate coincidence of two lines); *h*, hazy, diffuse, nebulous; *H*, very hazy, diffuse, nebulous; *l*, shaded or displaced to longer waves; *s*, shaded or displaced to shorter waves; *r*, narrow self-reversal; *R*, wide self-reversal; *w*, wide; *W*, very wide.

Table 2 represents a careful selection of data from the much more extensive observational material that included spectral lines due to impurities, components of resolved hyperfine structure, lines doubtfully belonging to molecular spectra, lines observed only once, and lines arising from overlapping spectral orders.

Because the rhenium metal used in this investigation was extremely pure, the identification and removal of spectral lines due to impurities was not difficult; the total number of such lines was about 30. Only the stronger lines of common contaminants appeared, as follows: B (2497.72 A), Si (2506.89 A), Ca (3933.66, 3968.47 A), Mg (2795.53, 2802.70, 2852.12 A), Al (3944.03, 3961.53 A), Cu (3247.74, 3273.96 A), Ag (3280.68, 3382.89 A), Pb (3683.47, 4057.81, 10290.6, 10499.1 A), Cr (4254.34, 4274.80, 4289.72 A), and Na (5889.95, 5895.92, 8183.29, 8194.82, 11403.9 A). In the visible spectrum a few lines of Cu (5105.54, 5153.22, 5782.13 A) and Zn (4680.15, 4722.17, 4810.53 A) were observed, but these are believed to arise from accidental flashes of the arc to the brass holders of rhenium electrodes rather than from the rhenium. The only other impurity deserving mention is potassium (7664.91, 7698.98, 11690.3, 11769.6, 11772.9 A), which indicates that the rhenium metal was probably prepared from potassium perrhenate. The presence of the above-mentioned impurity lines provided a reliable check on the scale of wavelengths for the rhenium lines. In nearly every case the measured wavelength of the impurity line agreed with its accepted value [18] within ± 0.01 A.

As stated before, the hyperfine structure of several dozen rhenium lines was resolved into two to six components, but the wavelengths of the individual components are omitted from table 2, where only the mean wavelength and over-all width of flag patterns is shown. There is some evidence of irregular hyperfine structures and mutilated multiplets in rhenium spectra, and such cases as appear in table 2 may be revealed in future analyses of these spectra.

Several hundred lines of low intensity were measured but not included in table 2 because some were recorded only once, and the remainder, mainly in the visible and infrared, were suspected of belonging to molecular compounds. A few lines published in earlier papers were not confirmed as atomic rhenium lines, and most of those now appear to be parts of molecular bands.

Despite the abandonment of many hundreds of lines observed in the arc and spark spectra of rhenium, table 2 contains more than twice as many lines as have heretofore been published. It should meet all present requirements for spectrochemistry and structural analysis of Re I and Re II spectra between the wavelength limits 2000 and 12000 A.

4. References

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TABLE 2. *Arc and spark spectra of rhenium*

MEANING OF LETTERS

P=band head, *c*=complex (narrow fine structure, isotopic or nuclear-spin hyperfine structure), *d*=unresolved double, *h*=hazy, diffuse, nebulous, *H*=very hazy, diffuse, nebulous, *l*=shaded or displaced to longer waves, *s*=shaded or displaced to shorter waves, *r*=narrow self-reversal, *P*=wide self-reversal, *w*=wide, *W*=very wide.

INTERPRETATION OF MIXED LETTERS AND NUMBERS

c .18*W*=complex, 0.18 A range of wavelength, very wide.
c .15*Ws*=complex, 0.15 A range of wavelength, very wide, shaded to shorter waves.
c 3, .21*Wl*=complex, 3 components, 0.21 A range of wavelengths, very wide, shaded to longer waves.
c 6, .222*Wl*=complex, 6 components, 0.222 A range of wavelengths, very wide, shaded to longer waves.
c 6, 1.25*Wl*=complex, 6 components, 1.25 A range of wavelengths, very wide, shaded to longer waves.

Wavelength	Intensity and other characteristics		Wavelength	Intensity and other characteristics		Wavelength	Intensity and other characteristics	
	Arc	Spark		Arc	Spark		Arc	Spark
A			*A*			*A*		
2000.47		6	2017.68		6	2032.02		30
2001.02		5	2017.56		5c	2032.29		5
2001.16		30	2017.866	200*R*	10*cw*	2032.59		20
2001.47	2	2	2017.98		30*cw*	2032.944	10c	1c
2002.32		3	2018.54	1	40	2033.335	1	7
2002.62		4	2018.95		2	2033.78	20*r*	15c
2003.532	50*R*	30c	2019.28	2*H*	30c	2034.020		20
2003.665		30c	2019.63	4	1	2034.44		3
2004.14		6	2019.82		2	2034.824		2
2004.39	2	1	2019.97		10	2035.00	6c	5*h*
2004.68	2	200	2020.12	9c	1c	2035.49	3	
2005.40		4	2020.34		4c	2035.51		10
2006.00		10	2020.475		10c	2035.96	10*ch*	
2006.28		15	2020.82		3	2036.20	3	15
2006.53		15	2021.07	2	1	2036.885		3
2006.87		7	2021.31		10c	2037.14	5	20
2007.06	8c		2022.54		6	2037.86		30
2007.12		10c	2022.74		3	2037.96	4	15
2007.88		8	2022.88		2	2038.23		20
2008.06	20*r*	15c	2023.07		5	2038.99	30*r*	20c
2008.67		2	2023.11	5c		2039.204	50*r*	30c
2009.19		5	2023.644	2	200	2039.57		60c
2009.92	2	100	2023.787	2		2039.88	3	70
2010.32		20c	2024.05		4	2040.36		15
2010.56		5	2025.43	4c		2040.64		2
2010.98		10	2025.51		30c	2040.81	3	10
2011.09		20	2026.23	4	1	2041.00	7*h*	1*h*
2011.82		10	2026.40		10	2041.27		15
2012.01	2	2	2026.86		5c	2041.82		2
2012.44		4	2027.29		10	2042.346	1	
2012.74	2	2	2027.41	6		2042.470	3	
2013.02		4	2027.45		3	2042.64	2	40
2013.13		2	2027.69		9	2043.06		3*h*
2013.47	3	1	2027.93	6	3	2044.36		4*h*
2013.65	5*cw*	2c	2028.27	2	2	2044.825		4
2013.88		4	2029.375		3	2044.903	2	
2014.66	7c	2c	2029.70	5*cw*		2045.75	10	5
2015.02		2	2029.84		7*d*	2046.244	5	
2015.43	1	50	2030.26	4	2	2046.318		6*h*
2015.49	2		2030.495		20	2046.774		10
2015.61		10	2030.68		2	2046.922	4*h*	2
2015.91		9	2030.903	40*r*	10*cw*	2047.67		7
2016.17	3c	2*h*	2031.521		20	2047.857	2	
2016.56	20*r*	3c	2031.655	4		2047.955		6
2016.59		10c	2031.96	8*cl*		2048.170		5

TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics	
	Arc	Spark
A		
2048.380		3
2048.754	4	
2049.079	400*R*	200c
2050.120		5
2050.458		6
2050.64		15
2050.73		10
2051.34		3
2052.32	10	10c
2052.546		10
2052.772		2
2053.10		10
2053.597	1	50
2053.730	3	
2054.98		9
2055.25	2	20
2056.01	2	2
2056.29	15c	7c
2056.59		15c
2056.70	2	
2057.11	3	
2057.43		6
2057.743	20c	10
2058.10		5
2058.33		2
2058.520	1	15
2058.92		7
2059.33		5
2059.75	2	80
2060.16	3c	4c
2060.392		3
2060.55	8	5
2060.76		9cl
2061.042	4	3
2061.19	3	2h
2062.02		10c
2062.26	2	
2062.46		40c
2062.74	3*H*	
2062.86		3
2063.13		5
2063.792	40cws	100cw
2064.16		20
2064.762	30	5
2064.87		30
2065.17		20
2065.64		3
2065.83		15
2066.53		8
2066.89	20	
2066.91		30c
2067.64	10	40c
2067.89	20r	8c
2069.15		3
2069.42	6	60c
2069.86		9
2070.13		5
2070.42		6
2070.82	3	
2071.11	3	
2071.175		10
2071.423		20
2071.65	3	
2072.09		20
2072.19	6	1
2072.59	5	
2072.62		30
2072.88		15c
2073.273	20c	10c
2073.898	10	6
2073.97	3	1
2074.70	20r	15
2074.82	5	2
2075.11		20
2075.20	5	2
2075.65	10c	
2075.70		50c
2076.30		20c
2076.55		9c
2077.08		4
2077.280	50r	20c
2077.78		20
2077.92	8h	1h
2078.21		7
2078.33		7
2078.65	5h	1h
2079.05		
2079.33		8
2079.92		20
2081.26	1	40
2081.35	7	
2081.98		60
2082.234	5c	100c
2083.342	4	20
2083.67	4	80
2083.925	40r	8c
2084.11	15c	5c
2084.53	15	5
2085.14		40c
2085.594	200*R*	30c
2085.76	7	80
2086.25	30*H*	10*H*
2086.96	20*H*	5*H*
2087.16	4	1
2087.30		10
2087.67	5	30c
2087.855	8	3
2088.23	3h	
2088.40		4
2088.58		8c
2088.61	3c	
2089.15		7
2089.68		3
2090.20	3	60c
2090.34	7	3
2091.48	3	
2091.535		30
2091.725	7	
2091.920		7
2092.24	50r	10c
2092.41	5	100cw
2092.50	2	50c
2092.835	15c	2c
2092.96		5c
2093.431		7c
2093.792		15
2094.00		2
2094.50	5	1
2094.622	8	2
2094.90		10c
2095.26	5	3
2095.33	2	
2095.52	4	
2095.57		6c
2096.22		3
2097.122	100*R*	20
2097.603	4	6
2097.703	4	
2097.77		10
2098.41	4	2
2098.53		3
2098.62	7cl	2
2099.28		10
2099.59		3c
2099.85		7
2100.10	3	3
2100.58		7
2100.63	5	
2100.753	5	
2100.85		8
2101.12	2	3
2101.51		8
2101.72	10c	5c
2102.28		4
2102.67	3	
2102.99		6c
2103.29		4c
2103.575	1c	40c
2103.864		6
2104.102	10c	8
2104.422		10
2104.59	3	
2105.573	1	30
2106.062		15c
2106.13	4	
2106.51	3c	60
2106.90	10c	4c
2107.452	60r	10cw
2108.447	10	5
2108.83		3
2109.22	100*R*	30cw
2109.46		3
2109.65		2
2109.86	3	
2109.953		40
2110.24	20*H*	5h
2110.868	3	2
2111.854	10	60
2112.245	4	150
2113.03		4
2113.87	30r	10c
2114.25	10	100
2115.51	1c	20c
2115.76	5	
2116.13	10	
2116.23		7
2117.64		10
2118.54		5
2118.671	1	15
2119.015		2
2119.52	4	
2119.67		1
2121.15	4	
2121.27		10
2122.081	2	20
2122.24	3	
2123.213		5
2123.84		2c
2123.89	5	
2124.445		9
2125.183		9
2125.576		3
2126.42	5c	
2126.73	3	4
2126.85	4	5
2126.96		3
2127.28		2
2127.85	2c	
2128.09		3c
2128.392		8
2128.53		4
2128.773	4c	6
2129.40		1
2129.579	2	10
2129.91		1
2130.16	2c	
2130.513	4c	10
2131.01	2	
2131.265		2
2131.44	2	2h
2131.59	2	
2132.53	4c	
2133.122	2	9
2133.41	5	2
2133.776		20
2134.34	4	
2134.594		6
2134.773		10c
2135.07	5	2
2136.10	3	
2136.22		5
2136.36	2c	
2136.701		4
2137.07		2
2137.50	20*Hw*	10*Hw*
2138.10	4*H*	1h
2138.44	5h	2h
2138.56		4
2138.63	4	
2139.04	3	100

TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics		Wavelength	Intensity and other characteristics		Wavelength	Intensity and other characteristics	
	Arc	Spark		Arc	Spark		Arc	Spark
A			*A*			*A*		
2139.20	4		2166.726		4	2193.14	6	4
2139.45		3	2166.880	2	40	2193.507	10c	8c
2139.59	2		2167.29		4c	2193.85	5	
2139.786		3	2167.39	10*H*	1*h*	2193.933		15c
2140.190		4	2167.44		4	2194.433		10
2140.66		6c	2167.938	200*R*	50	2194.561		10
2140.924	6	2	2168.42	15	10	2194.68	1	
2141.329		2	2168.77	5	1	2195.284	1	40
2141.545		2	2169.240		5	2195.84	8	1
2141.745	6	2	2169.49	5	3c	2195.97	10	3
2142.736	10c	20c	2169.62		5c	2196.284		2
2142.97	20*r*	5	2169.77		2	2196.72	50c*w*	10c*w*
2143.443	4	2	2170.340	5	10	2196.834		8
2143.89	3		2170.806	2	50	2197.130		30c
2143.96		8*h*	2170.970		10	2197.373		10
2144.085	2	30	2171.145		4	2197.44	10c	
2144.45	10c	5c	2171.267		3	2197.610		4
2145.01	2		2172.094		2	2197.928		15
2145.41		10	2172.618	1	30	2198.213		6
2145.89	1	5	2173.233		20	2198.401	15	3
2145.90	1	30	2173.39		10*H*	2198.617	5	1
2146.20	3c*w*		2174.05	8	4	2198.914	200*R*	40
2146.72		2	2174.24	10	5	2199.113		3
2147.03		2	2174.692		4	2199.50	10c	
2147.483	8	4	2175.346	20c	6c	2199.69	7	2
2147.97	6	4	2175.806	20c	10c	2199.82	4	
2148.13		3	2176.016		5	2199.96	4	3
2148.261	1	20	2176.206	200*R*	50	2200.219		4
2148.92	3		2176.35		3	2201.075	8	2
2149.28		3	2176.58		1	2201.32		1
2149.43	5c*w*	4	2177.28	50*Hw*	20*Hw*	2201.640		8
2149.59	1	4	2177.382		4	2201.68	7	
2149.818		20c*w*	2177.579	1	20	2201.911		20
2150.118		2	2177.851	2	100	2202.00	10c*w*	
2150.44	2	20	2178.04	6		2202.15	7	
2150.82		10c	2178.59	10	5	2202.19		10
2151.40	4	3	2178.778	1	20	2202.49	5	3
2151.74	6	2	2178.87	3		2202.695		2
2152.04		2	2179.03	4		2202.815	10c	5
2152.79		5	2179.09		5	2203.010	40	20
2152.98		2	2179.18	8c		2203.46		2
2153.30	8	4	2180.136	5	3	2203.579	1	20
2153.53		1	2180.405	30c	10c	2203.71		2
2153.79		3c	2180.54		5	2204.55	20c	7
2154.01	2	1	2180.78	15		2205.15	50c*w*	20c
2154.20	10c	2c	2180.804		10	2205.344		15c
2154.45		6	2181.02	20	10	2205.41	4c	
2155.056		5c	2181.430		4	2206.154	2	40
2155.24	2	2	2181.65	3		2206.707		4
2155.53		2	2181.77		100c*w*	2208.76	4	
2155.73	7	1	2181.81	4		2206.870	2	100
2155.96	10	4	2182.374		2	2207.376		3
2156.103		2	2183.158		5	2207.680	20	5
2156.23		2	2183.443		15c	2208.188		2
2156.673	100*R*	50	2183.72	100c*w**R*	10c*w*	2208.28	2	
2157.89	4	1	2184.19		1	2208.394	2	
2158.05		4c*s*	2184.540	10	10	2208.58	6	1
2158.292	2	20	2184.73		3	2209.045		2
2158.73	15c*w*	8c*w*	2185.16	20	3	2209.320		7
2159.14	7c	4c	2185.215		3	2209.800	30	
2160.04		1	2185.915		8	2209.87		20c
2160.42	10c	8c	2186.356	2	50	2210.02	40*H*	
2160.934		20	2187.62	3		2210.655	6	2
2161.15	15c*w*	7c*w*	2187.656		4	2210.81	4	2
2161.914		10	2187.77	50c	10*h*	2211.197	10	7
2162.326		1	2188.01	10	2	2211.33	10c	
2162.81	15c*w*	10c*w*	2188.221		10	2211.52		2
2163.07		7	2188.38	3	1	2211.933	10	4
2163.10	10		2188.50	6	2	2212.088	10	1
2163.56	6	3	2188.755		2	2212.211		7
2163.704		20	2189.60	8		2212.495		3
2163.72	3		2189.870	6	5	2212.809	10	4
2164.29		6	2190.260	4	50	2212.900		4
2164.56	20c*w*	10c*w*	2190.518	10c	10	2213.23	6	1
2164.773		4	2191.03	20*H*	3*H*	2213.50	2	
2164.91	6c*w*		2191.471	40c	10c	2213.68		20
2165.409	2	30	2192.23	8		2213.98	5	
2165.65	3		2192.44	10		2214.261	500*R*	1000c*w*
2165.901		15c	2192.567		20c	2214.58	300*r*	50c*w*
2166.52		2	1292.84	3c		2215.353	4	

TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics		Wavelength	Intensity and other characteristics		Wavelength	Intensity and other characteristics	
	Arc	Spark		Arc	Spark		Arc	Spark
A			*A*			*A*		
2215.535	2	2	2242.40	30	10	2266.582	----------	4
2215.80	6c	1c	2242.66	50	?	2266.733	----------	2
2216.161	1	50	2243.19	----------	20	2266.889	----------	4
2216.52	----------	5c	2243.261	10	4	2267.256	----------	40
2217.03	----------	3	2243.476	8	1	2267.358	3	----------
2217.158	10c	2	2243.79	8	1	2267.652	20	10
2218.36	8c 3, .21 *Wl*	----------	2244.112	15	7	2268.08	1	----------
2218.648	----------	5	2244.500	----------	4	2268.41	4	----------
2218.715	15	5	2244.63	----------	3	2268.46	----------	40c
2218.940	----------	7	2244.72	5	1	2268.803	10	2
2218.97	10	----------	2245.120	8	3	2269.061	----------	10c
2219.260	15c	8c	2245.37	50*H*	5*Fe*	2269.228	----------	2
2219.75	----------	1	2245.43	----------	9c	2269.613	----------	2
2220.438	----------	2	2245.884	----------	3c	2269.793	2	10
2220.577	10	5	2246.18	2	----------	2270.018	10c	10c
2220.69	----------	2	2246.444	20c	7c	2270.170	8	2
2220.920	2	5	2247.326	----------	10	2270.574	4	1
2221.845	----------	7c	2247.49	3	----------	2270.928	----------	5
2222.32	----------	2	2247.544	----------	9	2271.04	50*cw*	3c
2222.465	10	3	2247.948	----------	10	2271.300	40*r*	10
2222.76	15	6	2247.97	3	----------	2271.611	15	10
2222.932	----------	5	2248.55	5	----------	2271.97	2	----------
2223.08	2	----------	2248.63	2	50	2272.15	----------	1
2223.16	5	----------	2248.90	2	----------	2272.644	2	50
2223.20	----------	5	2249.04	2	----------	2272.931	5	1
2223.407	1	20	2249.24	2	----------	2273.14	2	----------
2223.77	3	----------	2249.51	50*cw*	5*cw*	2273.98	----------	10
2223.93	----------	6*cw*	2249.753	----------	1	2274.016	4	----------
2224.31	----------	15*h*	2250.273	----------	15	2274.20	----------	1
2224.41	5	----------	2250.33	3	----------	2274.618	300*R*	100c
2224.851	----------	7	2250.632	----------	3	2275.25	200*cw*	500 *c* .22 *W*
2226.048	----------	20	2251.148	----------	15	2275.724	----------	1
2226.418	300*R*	50	2251.273	15	1	2276.41	----------	1
2226.87	50*cw*	5c	2251.41	2	----------	2276.632	20	5
2227.021	----------	20	2251.593	2	40	2277.012	----------	10
2228.05	30c	10c	2251.76	7c	----------	2277.340	30c	5c
2228.389	----------	8c	2251.94	6	2	2277.926	----------	5
2229.104	1	20	2252.154	----------	10	2278.431	2	----------
2229.61	2	----------	2252.53	4	----------	2278.550	5	3
2230.43	2	----------	2252.61	----------	2	2278.635	----------	1
2230.47	----------	10c	2253.28	----------	8	2278.73	10	10
2230.61	5	----------	2253.48	----------	7*cl*	2278.948	----------	2
2230.68	----------	1	2253.848	----------	9	2279.15	----------	1
2230.83	10c	----------	2253.94	50*cw*	5*cw*	2279.563	2	15
2231.127	----------	8c	2254.196	----------	15	2279.87	----------	1
2231.561	4	----------	2254.790	30	10	2280.00	2	2
2231.92	2	----------	2255.729	100*r*	30	2280.540	10	3
2232.08	3	1	2255.937	----------	10	2281.07	----------	1
2232.292	4	50	2256.193	150*R*	50	2281.29	10*cs*	3c
2232.48	3	----------	2256.74	----------	2	2281.406	----------	10
2232.62	5	----------	2256.935	5	2	2281.620	200*R*	40
2232.964	----------	3	2257.25	15	5	2282.51	----------	5*h*
2233.404	----------	1	2258.406	3	----------	2282.980	2	20
2233.84	20	----------	2258.55	----------	8	2283.191	6	2
2233.91	3	10	2258.62	2	----------	2283.568	15	2
2234.07	30c	5c	2258.933	----------	7	2283.69	----------	1
2234.50	20c	3c	2258.98	10	----------	2283.818	5	1
2234.865	----------	10	2259.310	20	10	2284.78	----------	1
2235.110	7	3	2259.796	----------	6	2285.30	50	30
2235.440	50*r*	20	2260.00	----------	2	2286.608	2	60
2235.803	2c	100c	2260.20	5	----------	2287.003	----------	1
2236.03	----------	5c	2260.500	5	30	2287.17	----------	3
2236.577	----------	6	2260.83	10c	2c	2287.506	400*R*	100c
2236.77	6	1	2261.38	4	2	2289.178	----------	1
2237.47	2	----------	2261.595	2	----------	2289.688	----------	7
2237.63	8	2	2261.846	1	50c	2290.196	----------	10
2237.85	2	----------	2262.276	15c	5c	2290.715	50*cw*	20*cw*
2238.169	----------	10	2262.424	10	4	2291.299	10	5
2238.211	5	----------	2262.773	15c	3c	2291.66	8c	1
2238.348	----------	10	2263.13	5*h*	2	2291.884	----------	50*cw*
2238.603	40*r*	10	2263.617	8	1	2292.327	2	----------
2238.830	----------	3	2263.748	----------	9c	2292.50	1	----------
2238.944	8	4	2263.96	10*cw*	2	2292.520	----------	2
2239.16	6c	1c	2264.393	200*R*	100	2292.71	2	1
2240.00	----------	5	2264.98	----------	1*h*	2293.641	5	2
2240.05	30	10	2265.10	----------	3*h*	2293.678	----------	10
2240.29	2	----------	2265.416	40c	10c	2294.486	400*R*	100c
2240.63	30	2	2266.072	30c	10	2295.060	----------	15
2240.977	30	1	2266.18	2	10	2295.217	----------	3
2241.34	----------	2	2266.387	----------	2	2295.661	4	1

TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics		Wavelength	Intensity and other characteristics		Wavelength	Intensity and other characteristics	
	Arc	Spark		Arc	Spark		Arc	Spark
A			*A*			*A*		
2296.09		1	2318.46	3c	2	2343.46		4
2296.211	15		2319.091		1	2343.78	3c	
2296.24		15cl	2319.19	30r	10	2344.006	4	
2296.926	40r	10	2319.288		2	2344.19	10	
2297.43	1		2320.162	50r	20	2344.544		1
2297.497		6	2320.78		4	2344.776	100R	40
2297.81	7		2320.89		4	2345.282	20r	6
2298.094	8cw	100cw	2321.11	4	2	2345.51		10c
2298.35	15c	3	2321.272	8	4	2345.653	30c	10c
2298.586		10	2321.41	10	6	2345.985	3	
2299.413	7	1	2321.57	6	4	2346.139		1
2299.686		2	2321.70	10	4	2346.37	4h	
2299.769	20c	20c	2321.75		10	2346.43		2
2299.880		2	2321.91		2	2346.614	8	4
2300.109	6	1	2322.490	50R	20	2346.774	8	2
2300.613	6c		2322.700	4	2	2346.987		20
2300.736		15c	2322.89		10c	2347.064	10	2
2301.318	8	2	2322.945	10c	5	2347.288		5
2301.612		7	2323.409	2	60	2347.611	3	10
2301.815	1	40c	2324.108		3	2347.84	3c	
2301.884	4		2324.45		10c	2348.22	3cw	20cw
2302.25	1		2325.045	20	5	2348.557	4	1
2302.345		6	2325.424		2c	2348.792	8	2
2302.643	8	4	2325.54		1	2349.391	30r	10
2302.992	150R	30c	2326.16	2		2349.55	20c	
2303.370	3		2326.82	4		2349.61		10cl
2303.517	10	5	2326.88	10	10	2349.86		1
2303.690	10	5	2327.095	3		2349.94		3
2303.993		30cw	2327.265	7		2350.31	2	
2304.443	8	1	2327.306		100c	2350.46	20	10
2304.587	8	4	2328.189		5	2350.60	20r	5
2304.714	10	5	2328.664	30r	10	2350.653		3
2305.021		8	2329.28	4H	3H	2351.14	4	1
2305.22	4c		2329.89		8cw	2351.41		3
2305.545	20cw	2c	2230.18	6	2	2351.925		2
2305.726	10	3	2330.424	8	3	2352.069	100R	30
2305.934		2	2330.544	5	2	2352.24		3H
2306.14		2	2330.706	4	1	2352.481		4
2306.24	2		2330.878		10	2352.59		2
2306.268	2	4	2331.135	20c	10c	2352.790	4	1
2306.540	60r	20	2331.19		3	2352.906	10	4
2307.03		1	2331.374	8	4	2353.115		30
2307.215		5	2331.599		10	2353.18	5	
2307.39	10cw	2c	2331.73	20c	2	2353.55		4
2308.060		10	2331.81		10	2353.95	30r	5
2308.167		10	2332.51		2	2354.08	30r	10
2308.354	20	2	2332.77		2	2354.372		4c
2308.45		20c	2333.019	15	5	2354.66	4	1
2308.592	30c	4	2333.32	20c	5	2354.773	15	3
2308.658		15	2333.75		1	2355.02	10c	
2308.972		3	2333.91		5	2355.423	1	40c
2309.619		30	2334.33	20r	10	2355.868	10	2
2310.00	3	1	2334.45	10	2	2356.125		10
2310.134	10	3	2335.00	10c	3c	2356.496	30r	10c
2310.703		3c	2335.61	5	2	2356.62		1
2310.938			2335.730	20r	10	2357.035	15c	5
2311.189	20	5	2336.04		2	2357.26	5	1
2311.576	8	3	2336.10	20r	10	2357.60	3	
2312.011	7		2336.47	1	15	2357.66		3
2312.109		30c	2336.718	10	4	2357.72		1
2312.200	5		2336.923	2	50	2357.91		10cw
2312.814	9	5	2337.092	10	4	2358.022		3
2312.971	10r	8	2337.43	3c	1	2358.570	10	5
2313.12	5	1	2337.953	40R	20c	2358.940		2
2313.267		10	2338.451	20	5	2359.157		5
2313.340	20	8	2339.04		4	2359.323		1
2313.638		2c	2339.26	3		2359.47	5H	
2313.922		4	2339.48		1	2359.760		1
2313.98	6		2339.71		2	2359.98	4	4
2314.209		2	2339.86		3	2360.287	10	5
2315.186		2	2340.29	3h		2360.897	10c	2
2315.238	10	4	2340.344		20	2360.94		5c
2315.956	30r	10	2340.938		7	2361.47		10c
2316.04		2	2341.23	2		2362.078	2	5
2316.49		10c	2341.31		10	2362.415		10
2316.523	30c	10	2341.38	8	7	2362.54	2	10
2317.24	6cs	2cs	2342.06	2		2362.64	20c	
2317.722		5	2342.18		10	2362.85	20c	
2317.889	2	20	2342.731	30	5	2362.89		10c
2318.242		30	2343.320	2	7	2363.805	20	5

TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics	
	Arc	Spark
A		
2364.125	----------	5
2364.23	3c	----------
2364.44	3	----------
2364.91	----------	1
2365.316	50r	20
2365.666	20r	5
2365.90	150*R*	30
2366.078	----------	40
2366.68	3	6*cw*
2366.997	10	5
2367.16	----------	4c
2367.55	7	----------
2367.683	50r	20
2367.75	----------	1
2367.88	10	2
2368.062	----------	2c
2368.12	4c	----------
2368.20	----------	4
2368.527	5c	50c
2368.88	15c	5
2368.93	----------	4
2369.152	----------	10
2369.27	50r	15
2369.475	10	4
2369.97	----------	20c
2370.762	10	100
2371.500	30r	10
2371.69	----------	1
2371.842	----------	4
2372.610	40c	10c
2372.880	----------	7
2373.274	7	4
2373.476	10	50
2373.56	3	----------
2373.747	15	4
2373.962	1	15
2374.57	----------	3
2375.073	100r	20c
2375.33	2	----------
2375.815	15r	10
2375.93	10	2
2376.334	4	1
2376.629	10	3
2377.104	10c	3
2377.333	20c*H*	10c
2377.620	----------	10
2378.40	3	----------
2378.526	5	20
2378.98	----------	4
2379.101	3	20
2379.587	----------	3
2379.774	40r	15
2379.950	5	----------
2379.992	----------	5c
2380.225	20c	10c
2380.63	----------	2
2380.890	15	5
2381.136	40*cw*	20c
2381.81	6	4
2382.07	----------	10
2382.40	5*H*	2*H*
2383.04	8	4
2383.12	----------	7
2383.46	50r	20
2383.97	10*h*	3*h*
2384.382	----------	7
2384.50	10*h*	3*h*
2385.02	----------	8
2385.362	----------	15c
2385.48	15	4
2385.68	10	2
2385.834	6	
2386.176	----------	
2386.536	10	5
2386.895	5c	100*cw*
2387.458	10	5
2387.745	20c	5c
2387.92	----------	2
2388.319	----------	5c
2388.569	100r	20c

Wavelength	Intensity and other characteristics	
	Arc	Spark
A		
2388.918	----------	2
2389.110	20r	10
2389.270	5	----------
2389.379	----------	2
2389.62	1	30
2389.75	----------	3
2390.430	20r	10
2390.593	15	3
2391.278	30r	10
2391.845	10c	3c
2391.94	----------	3
2392.36	15	5
2392.67	6	3
2393.645	50r	10
2393.81	----------	40*cw*
2393.883	5	----------
2394.252	4	----------
2394.37	30r	10
2394.72	----------	5
2395.09	10c	2c
2395.33	7*H*	----------
2395.41	----------	3
2395.96	----------	3
2396.03	7	1
2396.06	----------	4
2396.13	3	1
2396.22	----------	1
2396.60	----------	10
2396.791	40r	15
2397.31	50c	20c
2397.605	4c	----------
2398.25	10	2
2398.420	2	60
2398.58	----------	10*cw*
2398.71	15	3
2398.888	15	4
2399.02	----------	4
2399.533	10	3
2399.648	6	4
2400.72	20c	20*cw*
2400.893	30	10
2401.680	30	20c
2402.115	15	5
2402.604	40c	20c
2403.036	10	50c
2403.87	----------	7
2404.340	100r	20c
2405.056	300*R*	70
2405.602	200r	30
2405.91	----------	3
2406.11	----------	2
2406.33	----------	7c
2406.695	60r	20c
2407.39	----------	3
2408.23	----------	5
2408.405	4	1
2408.578	3	1
2408.989	1	20
2409.777	----------	7
2410.000	1	20
2410.26	----------	5
2410.37	30r	20c
2410.80	6	2
2410.99	40r	20c
2411.220	4	----------
2411.245	----------	2
2411.947	----------	20c
2412.626	----------	2c
2412.974	----------	3c
2413.216	30	10
2413.629	----------	7*cw*
2413.741	10	----------
2413.81	----------	15
2414.198	----------	7
2414.48	----------	7
2414.587	30r	10
2414.99	----------	2*h*
2415.261	4	4
2415.84	10c	10c
2415.93	4*h*	4*h*

Wavelength	Intensity and other characteristics	
	Arc	Spark
A		
2416.265	5	40
2416.30	10	2
2416.441	10	7
2417.026	----------	6
2417.661	15	10
2417.815	----------	2
2417.89	2	----------
2418.03	----------	3
2418.201	2	30
2418.392	4	15
2418.96	----------	6
2419.404	60r	10
2419.807	100r	20
2419.955	3*h*	5c
2420.214	----------	10c
2420.28	2	----------
2420.35	5	1
2420.72	5	1
2421.38	30	----------
2421.41	----------	60
2421.66	3	----------
2421.730	40r	10c
2421.883	30r	10
2422.11	2	----------
2422.34	----------	2
2422.60	----------	9
2423.112	----------	20
2423.50	30c	4*h*
2423.78	10*H*	----------
2423.842	10c	100*cw*
2424.652	10	10
2424.95	2	2
2425.18	----------	1
2425.38	30c	10c
2425.45	----------	3c
2425.700	7	3
2426.195	10	3
2426.456	----------	2
2426.635	30	10
2427.148	----------	15
2427.21	7	----------
2427.73	8*H*	3*H*
2428.145	3	5
2428.576	300*R*	60
2428.84	----------	3
2429.097	----------	4
2429.204	10	6
2429.648	10	7
2429.78	8c	2
2430.515	----------	40
2430.750	----------	2
2431.068	----------	5
2431.538	50r	20
2431.744	8	4
2432.18	80c 18*W*	40*cw*
2432.617	5	1
2432.70	20	5
2432.87	----------	10c
2433.07	----------	2
2433.28	20	10
2433.365	----------	5
2433.608	5	2
2433.741	----------	40
2433.803	10	3
2434.536	5c	----------
2434.62	----------	20*cw*
2435.31	----------	15
2435.82	----------	4*d*
2436.046	10	5
2436.48	----------	3c
2436.51	3	2
2436.71	5	----------
2436.74	----------	10
2436.95	----------	4
2437.23	10	2
2437.43	1	10
2437.710	----------	10
2438.145	5	1
2438.20	1	8
2438.462	30	10

TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics		Wavelength	Intensity and other characteristics		Wavelength	Intensity and other characteristics	
	Arc	Spark		Arc	Spark		Arc	Spark
A			*A*			*A*		
2439.06	30c	10c	2463.141	----------	1	2487.21	5	2
2439.62	4	3	2463.307	15	5	2487.331	200*R*	100
2439.84	----------	5*h*	2463.84	5	1	2487.362	----------	70*cl*
2439.86	3	----------	2463.964	8	2	2488.104	----------	6c
2440.41	30	20	2464.29	----------	1c	2489.04	----------	30*l*
2440.58	10	3	2464.63	3	1	2489.335	----------	2
2440.91	----------	1	2465.13	30	8	2489.482	----------	4
2441.05	----------	1	2465.29	----------	10	2490.161	3	50
2441.35	3	10	2465.80	2c	20c	2490.26	2	30
2441.47	100*R*	30	2465.97	----------	3*ch*	2490.40	----------	3*h*
2442.08	----------	1	2466.042	5	----------	2490.50	4	----------
2442.510	40*r*	10	2466.546	3	----------	2490.769	8	3
2442.64	----------	1	2466.810	2	20c	2490.91	----------	1
2442.88	2	----------	2467.308	15	2	2491.07	9c	1c
2443.10	----------	10	2467.574	15c	100c	2491.234	2	10
2443.353	20	4	2467.706	2	----------	2491.497	2	----------
2444.09	100*cw*	----------	2467.80	----------	4	2491.881	1	30
2444.14	----------	7*h*	2467.85	20c	20*cl*	2492.13	2?	3
2444.54	----------	20	2468.195	----------	10c	2492.537	1	5
2444.943	70*r*	15	2468.480	----------	7	2492.55	9	8
2445.085	----------	10*cl*	2468.608	----------	4	2492.751	8	3
2445.144	8c	1	2468.695	5	----------	2492.838	3c	3
2446.285	8	3	2469.03	15	15	2493.17	----------	1*h*
2446.404	3	1	2469.356	5c	100*cwl*	2493.25	----------	2*h*
2446.575	----------	10	2470.052	8c	2	2493.461	----------	1
2446.881	10	5	2470.164	4	1	2493.597	----------	2
2446.978	30c	10c	2470.275	3	----------	2494.01	1	----------
2447.656	5	2	2470.610	5	50	2494.217	----------	3*h*
2447.852	2	----------	2470.92	3c	----------	2494.250	3	----------
2448.051	5	3	2471.049	2	20	2494.517	----------	1
2448.20	20	4	2471.205	----------	4	2494.609	1	1
2448.26	1	6	2471.426	----------	2*h*	2494.709	2	1
2449.033	5c	100c	2471.486	2	----------	2495.141	----------	7
2449.523	20c	20c	2471.93	2	1	2495.263	8c	4
2449.710	60*r*	20	2472.006	3	1	2495.386	----------	3*h*
2450.320	----------	7	2472.14	2	----------	2495.620	2	1
2450.413	2	----------	2472.55	----------	3	2495.93	5*H*	----------
2450.895	30	3	2472.78	----------	1	2496.039	30	20
2451.24	----------	50*H*	2473.72	5c	100c	2496.692	10	3
2451.32	2	----------	2474.208	15	2	2497.168	3*h*	----------
2451.683	6	1	2474.725	15	7	2497.320	----------	4c
2451.910	8	2	2475.172	10	30	2498.03	4c	----------
2452.067	----------	2	2475.470	----------	5*h*	2498.080	----------	6
2452.22	----------	2	2476.197	7	2	2498.215	20	10
2452.63	----------	2c	2476.275	5	----------	2498.566	----------	1
2452.790	2	----------	2476.332	----------	10c	2498.861	20	5
2452.949	3	1	2477.43	----------	100c	2499.19	1	----------
2453.14	40*r*	20c	2477.50	10	?	2499.475	7	3
2453.493	10	3	2478.07	5*h*	1	2499.608	2	1
2453.936	----------	4c	2478.545	----------	10*cl*	2499.968	----------	2
2454.082	3	----------	2478.58	2*h*	----------	2500.012	6	2
2454.334	----------	1	2478.99	----------	80	2500.312	10	4
2454.55	----------	2	2479.02	20c	----------	2500.568	10	10
2455.051	4	----------	2479.17	----------	2*h*	2501.05	----------	2
2455.097	----------	10	2479.289	1	----------	2501.35	2*h*	----------
2455.63	----------	2	2479.541	----------	4	2501.721	50*r*	20
2455.827	10c	100c	2480.631	----------	6	2502.09	1	----------
2455.987	20c	4c	2480.820	20c	----------	2502.348	30*cs*	200*cw*
2456.154	----------	1	2481.12	1	1*h*	2503.775	----------	3
2456.435	----------	2	2481.226	4	2	2504.08	----------	2*h*
2456.797	----------	8	2481.357	2	----------	2504.36	----------	2
2456.961	10*cs*	2*cs*	2481.534	2	2*h*	2504.493	----------	10*h*
2457.36	1c	100*cl*	2481.668	4	1	2504.595	20c	30c
2457.596	4c	----------	2481.98	1c	8*cw*	2504.861	1	----------
2458.200	----------	1	2483.109	6	2	2505.11	----------	1
2458.577	2	----------	2483.38	5	1	2505.210	----------	4
2458.833	----------	8	2483.920	200*R*	80	2505.39	----------	4
2459.105	5	2	2484.12	----------	2*h*	2505.43	30*h*	----------
2459.62	1	4	2484.406	----------	2	2505.945	30c	20c
2459.672	2	----------	2484.51	2c	----------	2506.585	----------	1
2459.81	4	1	2484.60	----------	3	2506.999	----------	10
2459.89	----------	1	2485.159	10c	2c	2507.403	30c	10
2460.24	20	5	2485.48	----------	5*Hw*	2507.854	----------	5c
2460.99	----------	3c	2485.50	3c	----------	2508.08	2*h*	----------
2461.196	200*R*	40	2485.805	20c	10	2508.482	----------	2*h*
2461.84	40*cw*	200*cw*	2486.102	----------	2	2508.861	2	20
2462.181	----------	2	2486.329	----------	2	2508.991	200*R*	100c
2462.539	10	3	2486.46	----------	4*cwl*	2509.50	----------	2*h*
2462.658	----------	2	2486.779	30*cw*	6c	2509.562	5c	2*h*
2462.915	8*cw*	6*cw*	2486.970	10c	3	2510.11	----------	20*cw*

TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics		Wavelength	Intensity and other characteristics		Wavelength	Intensity and other characteristics	
	Arc	Spark		Arc	Spark		Arc	Spark
A			*A*			*A*		
2510.771	----------	5	2535.774	----------	10*h*	2563.006	20*c*	10*c*
2511.250	----------	10	2536.398	----------	3	2563.971	2	1
2511.285	----------	10*h*	2536.510	----------	2	2564.186	50*R*	20
2511.618	5	2	2536.913	4	1	2564.347	10*c*	8*hl*
2511.720	2	----------	2537.015	6	3	2564.650	----------	2
2511.944	----------	5	2537.49	----------	5*c*	2565.297	----------	1*h*
2512.317	4	1	2537.517	4	2	2565.582	----------	10
2512.414	----------	2	2537.65	5*c*	2*c*	2565.839	6	4
2512.550	15	4	2537.877	4	2	2565.967	3	1
2513.87	2*h*	1*h*	2539.326	20*c*	10	2566.366	----------	60
2514.35	2*h*	2*h*	2539.727	----------	7	2566.569	8	3
2514.510	20	8	2539.86	1	----------	2566.735	4	1
2514.651	5	2	2540.057	7	5	2566.92	----------	4*hl*
2514.805	3*c*	1*c*	2540.45	3	----------	2568.329	5	3
2515.190	----------	2*h*	2540.513	40*r*	20	2568.638	10*c*	300
2515.351	2	2	2540.706	5*h*	7*h*	2568.817	2	----------
2515.470	6	5	2541.070	20*h*	3*h*	2569.02	4*h*	----------
2516.120	150*r*	100	2541.27	20*h*	3*h*	2569.192	----------	3*h*
2516.381	3	2	2541.514	----------	6	2569.327	4*c*	2
2516.52	----------	3*c*	2541.651	----------	4*h*	2569.828	----------	
2516.765	2	1	2542.09	3	4*h*	2570.046	4	3
2517.083	7	4	2542.920	4	2	2570.186	----------	3*h*
2517.350	7*h*	4*h*	2543.022	2	1	2571.255	10	10
2517.99	----------	2*h*	2543.210	----------	3*h*	2571.605	1	----------
2518.54	3*h*	----------	2543.671	10	15	2571.810	10*cw*	300*cw*
2518.720	----------	10*hw*	2543.835	8	5	2572.117	----------	5*h*
2518.87	5*c*	----------	2544.215	10	8	2572.476	2*h*	1*h*
2519.139	6	2	2544.739	100*r*	40	2573.760	20*c*	15*c*
2520.009	50*r*	20	2544.878	20*cw*	20*cw*	2573.988	3*h*	1*h*
2520.658	----------	2*h*	2544.952	8	5	2574.211	6	5
2521.50	10*c*	10*c*	2545.485	30*r*	30*c*	2574.686	3	1
2521.59	5	5	2545.258	----------	15*h*	2575.317	----------	30
2521.691	----------	10*h*	2546.098	2	1	2575.664	----------	1*h*
2522.004	5*c*	2*h*	2546.450	----------	2	2575.95	6*cw*	3*c*
2522.719	5	2	2546.74	1	----------	2576.238	----------	20
2523.190	4	1	2546.02	----------	2*h*	2576.316	6	3
2523.308	----------	2	2547.398	5	2	2576.408	4	1
2523.415	3	1	2547.521	1	2*h*	2576.68	1	----------
2523.519	3	1	2548.020	----------	7	2576.818	----------	3*cw*
2523.798	----------	7	2548.136	10	6	2577.030	3	1
2524.155	5	2	2548.386	----------	3*h*	2577.614	6	3
2524.30	----------	8*h*	2548.885	20	10	2578.120	10*cW*	8*cW*
2524.546	6	2	2549.372	6	3	2578.862	----------	10
2525.049	2*h*	----------	2549.847	5*hc*	----------	2579.005	10*c*	6*c*
2525.548	20*c*	5	2550.091	4*c*	100*cw*	2579.343	2	1
2525.653	----------	4	2550.338	4*h*	----------	2579.590	----------	1
2525.755	----------	10	2550.444	----------	5	2579.778	2*h*	1*h*
2526.32	----------	10	2550.613	5*h*	2	2580.102	----------	4*h*
2526.37	----------	6	2550.827	1	30*cw*	2580.203	4	2
2526.536	----------	3	2551.463	2*c*	2*c*	2580.311	7	15*hl*
2526.66	----------	1	2552.021	40*r*	20	2581.156	----------	4*h*
2526.809	10	4	2552.73	10*c*	20*c*	2581.421	----------	6
2526.905	----------	2*h*	2553.588	3*c*	100*cw*	2581.438	9*hl*	----------
2527.311	5	2	2554.18	15	10	2581.649	2*h*	1*h*
2528.186	----------	2*h*	2554.630	4	200	2582.111	----------	10*cWs*
2528.30	3*c*	----------	2554.929	6	3	2582.240	2	1
2528.486	1	20*c*	2555.116	2	1	2582.767	10	10
2528.62	1	10*cw*	2555.24	----------	2*h*	2582.870	----------	7*cw*
2528.87	4*c*	1	2555.32	3	1	2583.146	----------	4
2529.26	----------	2	2555.531	4	3	2583.408	3	2*h*
2529.50	15*c*	10	2555.666	5	3	2583.873	4	2
2529.57	----------	3*h*	2556.512	80*R*	40	2584.523	6	4
2529.898	----------	4	2556.784	----------	2*h*	2584.768	10	7
2530.237	----------	4*h*	2556.918	2	2	2585.061	6	3
2530.260	2	----------	2557.414	----------	20	2585.580	8*c*	2*c*
2530.457	3	1	2557.694	----------	15	2586.425	----------	1
2530.93	2*h*	----------	2558.062	10*c*	7*c*	2586.788	50*R*	30*c*
2531.404	5*c*	1*h*	2559.076	20*R*	10	2586.998	7	5
2531.672	2	1	2559.478	----------	5*h*	2587.160	15*cw*	4*c*
2532.33	----------	7*cw*	2559.707	6	3	2588.034	----------	50*h*
2532.48	5*c*	2*c*	2559.882	6	4	2588.297	----------	2
2532.536	----------	5*h*	2560.366	----------	1	2588.579	----------	60*cd*
2532.848	5	3	2560.602	----------	1	2588.786	2	1
2532.963	4	2	2560.754	----------	1	2589.218	3	2
2533.119	4	3	2561.184	----------	8*h*	2589.310	4	2
2533.310	15*r*	10	2561.27	2	----------	2589.594	6	3
2533.74	1	----------	2561.462	8	5	2590.489	4	2
2534.099	5	80	2561.712	----------	2*h*	2590.629	3*c*	1*c*
2534.805	30*cw*	20*c*	2561.920	----------	4	2591.100	5	2
2535.725	1*h*	----------	2562.051	2*h*	----------	2591.133	6	6

TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics	
	Arc	Spark
A		
2591.430	6	3
2591.582	30r	15
2591.889	10c	5c
2592.843	10*cws*	5*cw*
2593.048	----------	8h
2594.267	----------	2
2594.854	30*R*	15*cw*
2594.982	5	1
2595.234	60*R*	30*cw*
2596.016	----------	5
2596.404	10c	7
2596.780	10r	8
2596.950	15c	10c
2597.283	----------	1h
2597.961	9	5
2598.108	----------	3h
2598.631	10*R*	5*cw*
2599.528	7*cw*	2c
2599.856	50*R*	20
2600.215	----------	1h
2600.518	5c	2c
2600.866	10c	5c
2601.874	15c	8c
2602.550	10c	7c
2602.681	----------	2
2602.926	10	7
2603.462	15	9
2603.82	4?	60h*l*
2603.89	40*cw*	20c
2604.832	----------	2h
2606.480	----------	10
2607.316	8	3
2607.612	----------	200*cwl*
2607.936	10c	2c
2608.043	3	1
2608.501	10	400
2608.746	3	1
2609.085	5	2
2609.204	5	2
2609.404	9	4
2609.705	----------	2
2609.839	----------	5
2609.86	2h	----------
2610.120	----------	2h
2610.545	----------	20h
2610.690	4	1
2610.874	----------	8c
2611.536	50*R*	10
2611.603	40*R*	15
2611.702	5	2
2612.463	----------	7*Hw*
2612.730	10c	3c
2612.788	----------	8
2612.858	6	2
2612.929	5	2
2613.235	10	3
2613.363	----------	2h
2613.744	15	6
2614.168	2	1
2614.558	50*R*	20c
2614.856	3	1
2615.274	----------	2h
2615.59	----------	5h
2615.676	6	5?
2615.76	----------	5h
2616.042	1	----------
2616.130	----------	2
2616.215	3h	1h
2616.720	4*cw*	150*cwl*
2617.112	15	6
2617.442	10	5
2618.374	4h	4h
2618.71	----------	4h
2618.742	4h	?
2618.80	----------	5h
2619.082	----------	4h
2619.502	----------	1h
2619.658	1	----------
2619.805	----------	10h*s*
2620.026	40*R*	20
2620.344	30*R*	20
2620.528	3*c*	1
2620.937	----------	2h
2621.144	10	5
2621.206	----------	10
2621.310	5	2
2621.779	----------	2
2621.870	----------	3
2621.975	15	6
2622.276	----------	3
2622.752	40*R*	20
2622.882	3*H*	1*H*
2623.285	20*cw*	10*cw*
2623.772	2	1
2624.591	----------	10h
2624.906	----------	2
2625.041	8	3
2625.128	3	1
2625.154	----------	2h
2625.438	----------	2h
2625.806	7	2
2625.898	----------	2h
2626.200	1	----------
2626.636	5	2
2626.879	----------	2
2627.450	1	----------
2627.868	----------	4h
2627.880	3	1
2628.258	----------	100h
2629.144	1	----------
2629.603	----------	2h
2630.150	8	3
2630.436	----------	8
2630.652	3h	----------
2630.754	7	3
2630.861	1	30?
2630.957	2	----------
2631.569	20*cs*	8c
2631.836	----------	6h
2632.16	----------	20c .16*Wl*
2633.006	10	3
2633.084	----------	8
2633.614	20	15
2633.776	----------	2h
2633.892	2	----------
2634.352	10	4
2634.798	----------	2h
2634.908	2	1
2635.115	----------	2*H*
2635.831	3c	200*cwl*
2636.019	2	----------
2636.637	100*R*	20
2637.006	10c	150c
2638.147	----------	7h
2638.656	2h	1h
2638.919	3	2
2639.346	----------	3
2640.140	----------	5*cw*
2640.282	8c	2c
2641.021	2	30
2641.173	10	1
2641.300	----------	3
2642.131	1	10
2642.25	----------	30*cw*
2642.752	60*R*	50c
2643.092	3	1
2643.672	----------	2*H*
2644.266	1	5
2644.563	----------	4h
2644.701	3	1
2644.768	5	2
2645.212	----------	2*H*
2645.804	10	4
2646.100	----------	1h
2646.379	9	3
2646.513	----------	1h
2647.128	30*R*	20c
2647.240	2	1
2647.578	1	20
2647.798	3h	----------
2648.100	7	2
2648.462	----------	50h
2648.508	6	----------
2649.050	50*R*	40c
2649.584	10	5
2650.197	----------	10h
2650.339	----------	8c
2650.593	----------	4*cw*
2650.977	----------	2
2651.349	----------	2*H*
2651.662	----------	5
2651.903	100*R*	30
2652.288	----------	2
2652.392	6	1
2652.506	----------	6h
2652.911	20	10
2653.186	----------	1h
2653.485	----------	5h
2653.740	7	4
2654.120	40*R*	15
2654.390	----------	2h
2654.773	10	2
2654.908	----------	10*cw*
2655.048	----------	3c
2655.178	10	5
2655.292	----------	1h
2655.844	15c	8c
2656.392	----------	2h
2656.486	2h	----------
2656.846	----------	3
2656.950	5	1
2657.449	10c	5c
2657.50	----------	1
2658.235	----------	7c
2658.588	7	4
2659.024	20	8
2659.236	----------	1
2659.510	15*cw*	2*cw*
2659.552	----------	4
2659.792	10	7
2660.040	2c	----------
2660.214	----------	20c
2660.342	5	2
2660.538	7	4
2660.628	8	4
2660.928	----------	7
2661.034	9	3
2661.223	2	1
2661.506	1	1
2661.760	5	2
2662.196	4	2
2662.464	----------	4
2663.159	1	1
2663.633	50*cw*	30*cw*
2664.215	10	6
2664.556	----------	1
2664.807	15	6
2664.908	2h	1h
2665.688	----------	1
2665.90	5*Hc*	2*Hw*
2666.224	----------	1
2666.421	1	----------
2666.632	----------	2h
2667.130	20c	9c
2667.54	----------	4*H*
2667.793	10	4
2667.893	----------	4h
2668.011	----------	2h
2668.194	2	----------
2668.887	5*H*	4*H*
2669.354	----------	3h
2669.536	----------	1
2669.740	----------	1
2669.868	5*cw*	1*cw*
2670.236	20	9
2670.790	30c	20c
2671.329	3c	1c
2671.842	40*cw*	20c
2672.054	7	4
2672.285	2	----------

TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics	
	Arc	Spark
A		
2672.420	5	2
2672.770	20c	6c
2674.339	200*R*	100
2674.44	----------	1h
2674.594	----------	4h
2674.917	5	2
2675.525	2	1
2675.990	10	4
2676.088	9	2
2676.253	10	3
2676.866	6*H*	3*H*
2677.032	30c	20
2677.231	----------	2h
2677.416	----------	6h
2677.764	15c	8
2678.054	3c	1
2678.530	----------	4
2678.857	2	1
2679.096	20c	10c
2679.626	7	3
2679.914	30c	20c
2681.010	9	4
2681.338	----------	5*H*
2682.067	----------	2
2682.368	5	2
2682.502	7c	3c
2682.888	----------	6h
2683.030	3c	1c
2683.558	40c*w*	30c
2683.688	----------	9h
2684.382	3	1
2684.438	1	----------
2684.697	6c	1
2684.748	----------	80h
2684.905	3	1
2684.980	----------	100c*wl*
2685.214	5	2
2685.311	10	5
2686.160	2	1
2686.344	2	1
2687.199	6c	2c
2687.592	----------	3h
2688.319	----------	3h
2688.528	100c*w*	60c
2689.340	7*Hwl*	3*Hw*
2689.838	----------	2c*w*
2690.17	1	----------
2690.247	20*Hw*	20*H*
2690.755	30*Hw*	10*H*
2691.262	----------	3c*W*
2691.694	----------	30c*w*
2692.596	----------	2h
2693.104	----------	30
2693.224	4	2
2693.719	8	3
2693.822	8	3
2694.034	3	1
2694.394	20c	10c
2695.248	----------	8c
2695.41	----------	1h
2695.562	15c	7h
2695.668	----------	4h
2695.91	----------	1
2696.159	2	1
2696.298	----------	3h
2696.376	7c*ws*	4c*w*
2696.640	7	2
2696.988	2h	1
2697.265	20c*w*	10c
2697.368	2	1
2697.804	20c*w*	10c*w*
2698.794	15h	6h
2699.462	----------	5
2699.580	15c	4c
2699.978	3	1
2700.027	----------	5
2700.211	----------	8c
2700.475	2	----------
2700.891	8	2
2700.977	2	----------
2701.206	3h	2h
2701.556	----------	1h
2701.726	----------	1h
2702.329	----------	20h
2702.668	20	8
2703.245	10	6
2703.510	2*H*	1*H*
2703.743	----------	3h
2704.099	----------	3
2704.179	3	1
2704.369	20c	10
2704.769	6	2
2705.076	6c	2c
2706.056	15	7
2706.39	----------	2h
2706.480	5	2
2706.996	----------	2h
2707.074	2h	1
2707.401	15c	3c
2707.852	10	5
2708.322	----------	4h
2708.442	7	3
2709.500	2	1
2709.91	----------	10c*w*
2710.224	20c*w*	8c*w*
2710.36	----------	2h
2710.403	15c*ws*	6c
2710.562	----------	5c
2710.667	1	----------
2711.008	----------	10h
2711.298	----------	6h
2711.382	2	----------
2711.835	----------	1
2712.249	2	----------
2712.476	20c	9c
2712.646	----------	8h
2712.700	5	1
2713.024	15c	7c
2713.160	10c	7c
2713.375	----------	15c
2713.664	8	3
2713.828	----------	3h
2713.99	3*H*	----------
2714.130	----------	2
2715.052	----------	2h
2715.474	300*R*	150
2715.770	30*r*	15
2716.054	2	----------
2716.144	----------	3
2716.246	20c*w*	7c*w*
2716.419	8	2
2716.63	----------	2c
2716.764	15	7
2717.090	3c*w*	1c*w*
2717.219	7c	3c
2717.670	----------	10c*w*
2718.01	3*H*	2*H*
2718.659	----------	3
2718.789	10c	4c
2719.324	----------	2
2719.536	15	6
2719.836	----------	6h
2719.848	9	----------
2720.068	9	7h
2720.364	2	1
2720.059	10c	3
2721.093	1c	----------
2721.211	----------	5h
2721.316	----------	4h
2721.55	----------	8h
2721.675	7	3
2722.206	60c	50c*h*
2722.702	80c	50c*h*
2723.356	10	3
2723.836	30c	20c
2724.046	2	1
2724.253	----------	3h
2224.361	----------	2h
2724.437	5h	2h
2724.686	9	3
2724.934	3c	1
2725.520	----------	3c*w*
2725.890	1	15
2726.323	2	1
2726.57	----------	3c*l*
2726.870	----------	15h
2727.34	----------	10c .19*Wl*
2727.548	20c	9c
2727.998	----------	2h
2728.286	3h	2h
2728.628	10	4
2729.040	----------	3c
2729.209	2	1h
2729.427	4c	1c
2729.635	10	5
2729.712	----------	4h
2729.803	----------	2h
2730.027	----------	10
2730.247	4c	1c
2730.668	----------	10h
2730.826	10	2
2730.911	----------	2
2731.228	3h	1h
2731.416	2c	----------
2731.562	5c*l*	150c*wl*
2732.206	50*R*	10
2732.398	----------	8c*w*
2733.04	10c*l*	300c*l*
2733.41	15c*w*	5c*w*
2733.96	5h	2h
2734.31	10	4
2734.43	----------	2h
2734.886	10	5
2735.350	----------	2h
2735.74	1c	4c*w*
2736.270	----------	1h
2736.522	6	5h
2736.767	10c	4c
2737.556	----------	5h
2738.323	15	8
2738.625	4	2
2738.752	10c	4h
2739.945	20c	10c
2740.074	4	2
2740.468	----------	2h
2741.506	----------	1h
2741.967	15c	30c
2742.744	7	3
2742.856	10	6
2743.122	2	1
2743.258	4c	1c
2743.850	3	2
2743.735	2	1
2743.874	15	10
2744.207	20c	6c
2745.014	2	1
2745.264	----------	2*H*
2745.564	5*H*	2*H*
2745.867	15	6
2747.438	20*r*	10
2747.627	1	----------
2748.55	----------	20*d*
2750.322	8	1
2750.564	----------	80c
2751.38	2h	1h
2751.51	3	1
2751.620	----------	6h
2752.494	----------	6c*w*
2752.852	15	7
2753.046	30c	20h
2753.289	----------	2
2753.638	2c	100c*ws*
2754.014	----------	3
2754.510	5h	3h
2755.212	20c	4c
2755.330	----------	6h
2755.854	----------	10h
2756.71	3h	1h
2756.806	----------	2
7752.486	15	6

TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics	
	Arc	Spark
A		
2757.700	----------	4*h*
2757.996	40*r*	15
2758.05	10*h*	7*h*
2758.418	----------	3*h*
2758.706	10	4
2758.767	3	2
2759.140	----------	1*H*
2760.004	2*H*	2*H*
2760.212	1*h*	----------
2760.404	3*h*	2*h*
2760.494	----------	1*h*
2761.008	3*h*	2*h*
2761.502	2*h*	1*h*
2761.926	20*c*	8
2762.786	4	2
2763.295	40*cwl*	15*cl*
2763.792	40*c*	20*c*
2764.704	5*h*	3*h*
2765.065	----------	2*d*
2765.282	2	----------
2765.30	----------	7*h*
2765.69	----------	30*h*
2766.051	9	3
2766.102	----------	7
2766.390	30*c* .13*W*	20*cw*
2766.548	7	4
2767.576	5	2
2767.744	20	10
2768.177	----------	2*h*
2768.282	6*H*	3*H*
2768.851	15	8
2768.954	3	1
2769.315	30*cw*	20*cw*
2769.735	4*cw*	2*c*
2770.030	----------	2
2770.130	----------	2*cw*
2770.417	70*R*	30
2770.51	----------	2*h*
2770.84	----------	1*h*
2771.609	15*c*	8*c*
2771.994	----------	2
2772.421	8	4
2772.687	3	1
2773.109	20*c*	10
2773.214	2	1
2773.602	3	2
2774.042	----------	3*h*
2774.383	10*c*	4*c*
2774.599	5	2
2775.126	10*cw*	5*cw*
2775.457	2	1
2775.639	15*c*	4
2775.948	10*cw*	6*c*
2776.296	----------	3*h*
2776.560	1	----------
2776.960	9	5
2777.223	8	4
2777.438	1	1
2777.71	15*cw*	6*cw*
2777.797	----------	50*c*
2778.092	15	9
2778.418	3*c*	1*c*
2778.498	10	5
2779.082	10*c*	5
2779.290	15*c*	5*c*
2780.094	----------	3
2780.850	15*cw*	8*c*
2781.094	----------	4*h*
2781.434	30*r*	15*c*
2781.714	----------	3*h*
2782.101	----------	10*h*
2783.141	7	3
2783.570	60*cw*	40*cw*
2784.042	----------	3*h*
2784.389	2*c*	1*c*
2784.618	----------	1
2785.206	50*r*	30
2785.424	10	5
2785.714	9	4
2785.960	2	1

Wavelength	Intensity and other characteristics	
	Arc	Spark
A		
2786.138	15	9
2786.450	3	1
2786.558	20*r*	8
2786.652	----------	5*h*
2787.386	7	4
2787.540	1	1
2788.207	----------	3*h*
2789.026	1	5*h*
2789.173	7*c*	2*c*
2789.268	15	6
2789.58	----------	5*cwl*
2789.65	2*H*	2*H*
2790.415	----------	2*h*
2790.939	30*c*	15*c*
2791.04	----------	1*h*
2791.290	50*r*	30*c*
2791.39	----------	1*h*
2791.626	10	5
2792.010	3	1
2792.382	3*cw*	3*cw*
2792.940	2	1
2793.654	15*c*	10*c*
2793.896	10*c*	7*c*
2794.036	2	1
2794.171	9*h*	3*h*
2794.472	3	1
2794.632	----------	20*h*
2795.028	----------	3*h*
2795.426	----------	10*h*
2796.073	10*l*	3*l*
2796.467	2	1
2796.616	9	3
2796.958	----------	1*h*
2797.208	----------	1*h*
2797.444	7*c*	3*c*
2797.992	----------	5*h*
2798.104	10	5
2798.640	3	1
2798.870	----------	5*h*
2798.918	----------	3*c*
2799.245	3	2*h*
2800.112	8*c*	4*c*
2800.296	3	1
2800.621	5	3
2800.748	4	1
2801.184	3*c*	2*h*
2801.562	----------	2*h*
2801.993	1	1
2802.24	15*Hw*	5*Hw*
2802.408	3	2
2802.829	10*cw*	3*cw*
2802.97	----------	1
2803.053	----------	1
2803.28	3*cl*	20*c* .10*wl*
2803.925	----------	10*hl*
2804.506	5*c*	2*c*
2805.105	4*c*	1*c*
2805.398	3*c*	1*c*
2805.977	7	3
2807.510	3*h*	2*h*
2807.618	----------	2*h*
2807.86	20*cws*	10*cw*
2808.456	4*h*	2*h*
2809.109	3	2
2809.370	3*c*	1
2809.435	----------	10*h*
2809.98	2*c*	1*c*
2810.330	----------	10*h*
2810.518	2	1
2811.495	----------	2*h*
2812.073	15	7
2812.356	20	9
2813.112	15	7
2813.53	----------	20*h*
2813.64	5	2
2813.964	20*h*	10
2814.676	40*R*	30
2815.278	2*c*	----------
2815.31	----------	3*c*
2815.640	10	5

Wavelength	Intensity and other characteristics	
	Arc	Spark
A		
2816.319	30*c*	20*c*
2816.954	30*c*	15
2818.444	9*c*	3*c*
2818.474	----------	3*h*
2818.783	2*cw*	20*cwl*
2819.528	4	2
2819.779	4*cw*	60*cwl*
2819.951	50*cw*	40*cw*
2820.01	10*r*	5?
2820.290	4	2
2820.976	4	2
2821.110	----------	8
2822.123	15	7
2822.341	----------	3*h*
2822.407	9	1
2822.494	----------	3*h*
2823.193	15	8
2823.310	2*c*	1*c*
2823.592	2	1
2823.641	2	1
2823.750	2*cw*	----------
2823.882	2*cw*	150*cw*
2824.245	20	7
2824.365	4*c*	4
2824.596	----------	5*h*
2824.939	----------	5*H*
2825.458	20	10
2825.50	----------	4*h*
2825.846	2	1
2825.952	----------	1*cw*
2826.670	1*h*	1*h*
2826.759	3	1
2826.812	4	2
2826.904	----------	1*h*
2827.284	7	5
2827.523	30*c*	15*c*
2827.834	7	3
2828.226	10*cwl*	10*c*
2829.164	4	2
2829.887	10*c*	4*c*
2830.096	6*c*	2*h*
2830.352	15*h*	10*h*
2830.833	9	3
2831.162	----------	2*h*
2831.560	----------	1
2831.752	----------	3*h*
2831.854	2*h*	2*h*
2832.245	----------	5*h*
2832.540	2*h*	2*h*
2832.857	----------	1*h*
2833.02	2	1
2833.05	----------	4*c*
2834.077	40*cw*	20*d*
2834.608	15*c*	6*c*
2834.782	----------	4*cw*
2835.034	5	2
2835.844	3	1
2836.005	6	2
2836.361	----------	5*h*
2836.596	7*hs*	3*h*
2836.991	15*cw*	8*cw*
2837.547	30*c*	20*c*
2837.972	3*h*	----------
2838.109	7	3
2838.238	----------	10
2838.566	3	2
2839.06	----------	5*c* .20*Wl*
2839.193	8	3
2839.657	----------	3*h*
2840.024	----------	4*h*
2840.348	50*r*	40*c*
2840.44	----------	2*h*
2840.979	3	3
2841.275	----------	1
2841.669	----------	2*H*
2841.798	----------	2*h*
2842.588	----------	2
2843.000	60*r*	50
2843.10	----------	3*h*
2843.562	----------	3*h*

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TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics	
	Arc	Spark
A		
2843.665	3	1
2843.762	----------	5h
2844.182	20	10
2844.854	----------	1h
2845.040	----------	1h
2845.176	6	5
2846.478	8	3
2846.970	20c	10c
2847.185	----------	5c
2847.568	----------	7h
2847.744	6	3
2848.112	2h	2h
2848.280	3	1
2848.360	3	1
2848.400	3	1
2848.966	----------	10h
2849.22	----------	6c .12*Wl*
2849.602	3*H*	2*H*
2850.275	8c	3c
2850.590	----------	3
2850.975	60*r*	40
2851.188	----------	3h
2851.720	----------	8h
2851.744	2	----------
2852.054	10c	3
2852.181	6c	2c
2852.394	9	5
2852.841	20*cw*	7*cw*
2852.966	----------	6*hl*
2853.740	----------	4h
2853.776	3*Hs*	----------
2854.122	----------	3h
2854.304	----------	1
2854.434	----------	2
2854.740	----------	3*cw*
2855.334	3*H*	1*H*
2855.528	10	5
2855.772	3c	1*c*
2856.447	----------	1
2856.720	3*H*	6h
2856.908	----------	2h
2857.075	2*cw*	1*H*
2857.435	10	6
2857.575	----------	8h
2857.662	----------	2h
2857.808	4*cw*	2*cw*
2857.985	----------	4
2858.250	3	1
2859.445	8c .14*Wl*	4*cw*
2859.839	10c	----------
2859.87	----------	15*cw*
2859.92	----------	2
2860.074	20	6
2860.254	15	5
2860.550	----------	20h
2860.933	3h	1h
2861.260	----------	10c
2861.682	----------	10c
2862.009	2	1
2862.187	8	3
2862.56	3	1
2862.85	----------	6*cw*
2862.890	15*cw*	5*cw*
2863.00	----------	2c
2864.280	----------	10h
2864.563	15*c*	10c
2864.831	10c	5c
2864.526	3	----------
2865.554	----------	3h
2865.612	2	1
2866.294	----------	2*H*
2866.582	3h	1h
2866.926	3h	2h
2867.193	30c	20c
2867.276	3	2
2867.770	3*H*	2*H*
2869.143	10c	3c
2869.200	----------	4c
2869.764	3c	2h
2869.864	3c	2h
2870.000	----------	7h
2870.397	----------	2h
2870.784	----------	3
2871.102	----------	2
2871.432	----------	2
2871.82	30*cw*	20c
2872.008	----------	3h
2872.304	10	5
2872.668	10c	4c
2872.73	----------	4c
2873.104	3*cw*	2*cw*
2873.840	6	2
2875.282	30*cw*	20*d*
2875.698	----------	30
2876.024	5	3
2876.860	15	5
2877.528	----------	3h
2878.226	----------	5*cw*
2878.538	1	----------
2879.271	20	10
2879.391	3	1
2880.212	1	----------
2880.630	----------	8h
2880.840	6	----------
2880.856	----------	10h
2881.546	10	5
2881.874	----------	60h
2882.226	9	3
2882.367	----------	2h
2883.083	3*cw*	1*cw*
2883.444	30*c*	20*c*
2883.045	15*c*	10*c*
2884.244	----------	20h
2884.452	7*c*	2*c*
2884.636	15	10
2885.120	4	3
2885.220	4	3
2885.54	2*c*	2h
2885.710	----------	2h
2885.930	10	3
2886.312	4	1
2886.435	----------	2h
2886.544	7	3
2886.774	----------	10h
2886.935	15*c*	6
2887.307	15*c*	6
2887.676	300*R*	200
2888.06	3*cl*	40*c* .10*wl*
2888.113	1	4
2888.456	4	1
2889.448	20*c*	10*c*
2889.832	----------	10*cw*
2891.481	20	10
2891.878	30*c*	15*c*
2892.093	----------	10*c*
2892.634	20*c*	10*c*
2892.724	----------	3h
2893.475	----------	3*c*
2893.636	----------	3*cw*
2894.123	1h	1h
2894.322	10	6
2894.422	2	1
2894.969	4*H*	1*H*
2895.176	----------	2h
2895.328	2	1
2895.650	15*c*	8*c*
2896.012	60*R*	30*c* .15*Wl*
2896.446	8	4
2896.668	1h	----------
2897.022	5	2
2897.242	----------	10*c*
2897.401	3*c*	1*c*
2897.456	3	2
2897.585	10*c*	6
2898.785	10	6
2899.621	3	2
2900.012	----------	6
2900.388	----------	7*c*
2900.959	3*c*	1*c*
2901.352	2*c*	1h
2901.54	----------	2*c*
2902.112	3*c*	1*c*
2902.48	100*cl*	?
2902.55	?	60*cw*
2902.886	----------	6
2903.293	1	1
2903.760	5	2
2904.043	3*c*	2*H*
2904.55	3*cl*	30*c* 3, .12*Wl*
2904.982	----------	6h
2905.393	10*c*	6*c*
2905.584	30*c*	20*c*
2905.854	----------	2*cw*
2906.016	15*c*	10*c*
2906.11	----------	2h
2906.775	----------	1h
2907.100	10	5
2907.231	1	2
2907.434	2h	1h
2908.132	3*cw*	2*cw*
2908.344	20	15
2908.676	----------	4h
2908.704	2	----------
2909.127	----------	4*hc*
2909.166	2	1
2909.820	60*r*	50
2909.93	----------	3h
2910.084	9	6
2910.308	----------	1h
2910.818	----------	7*hc*
2911.094	2	1
2911.232	8	6
2912.025	3h	3h
2912.580	5	4
2912.915	3	2
2913.154	10	8
2913.639	----------	5
2913.805	4	2
2914.298	----------	1h
2914.570	----------	2
2915.246	3	2
2915.286	2	1
2915.643	----------	2*cwl*
2916.256	3	2
2916.348	2*cw*	2*c*
2916.731	----------	20
2916.850	5c	3c
2917.173	----------	1h
2917.468	----------	8h
2917.484	5	----------
2917.834	3*cw*	2*cw*
2918.052	2	1
2918.760	1	1
2918.877	7	5
2919.407	20	15
2920.608	----------	3h
2921.076	1	1h
2921.332	----------	1h
2921.676	3	2
2921.804	2h	3h
2922.694	----------	6h
2923.220	2	1h
2923.344	1	1
2923.686	----------	6h
2924.388	----------	1h
2924.60	20*c* .15*Ws*	15*cws*
2924.784	----------	9h
2925.195	20	15
2925.606	2*d*	----------
2925.703	----------	10h
2926.124	1	----------
2926.134	----------	10h
2926.661	----------	20h
2926.934	9*c*	6*c*
2927.42	40*c* .14*Wl*	40*cw*
2927.714	5	4
2927.852	2	5h
2927.90	----------	2h
2928.576	7	5
2929.044	1h	1h

TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics	
	Arc	Spark
A		
2929.48	10c	5c
2929.530	10	8c
2930.411	4	4h
2930.610	20c	20
2931.420	1	1
2931.660	4	4
2932.223	4	3
2932.317	7	5
2932.657	----	6h
2933.434	4	3
2933.542	----	7h
2934.010	5	3
2934.529	----	40
2935.32	6c .15*W*	5c*W*
2935.752	----	1h
2936.500	15	15
2937.451	----	1h
2937.810	8	6
2938.442	----	1h
2938.570	1	1
2938.644	1	1
2938.772	5	3
2938.841	2	1
2938.983	----	5h
2939.557	----	3
2939.872	3	2
2940.049	5	4
2940.554	3	2
2940.974	----	50cl
2941.141	----	3h
2941.557	9	7
2942.858	----	4cw
2943.145	50r	40
2943.382	10c	6c
2943.794	----	8h
2944.320	8	6
2945.106	3c	2c
2945.161	----	3h
2945.708	5h	3h
2945.886	5	3
2946.572	9	7
2946.802	1c	1c
2947.49	----	2*H*
2947.54	2*H*	----
2948.104	----	1h
2948.384	2h	2h
2948.640	2cw	2cw
2949.088	15c	10c
2949.261	7cw	5c
2949.880	10	9
2950.220	----	2h
2950.731	----	3h
2950.828	10	7
2950.920	7	4
2951.690	2h	2h
2952.961	2c	----
2952.982	----	3h
2953.832	1	2
2954.335	15c	15c
2954.454	1	2h
2954.580	6	5
2954.688	5	3
2954.968	2	----
2954.99	----	10c .14*Wl*
2955.730	----	8c
2956.086	2h	1h
2956.254	----	5
2956.466	3	2
2957.413	3c	2c
2957.762	2cwl	1
2957.907	----	80cw
2958.904	7	6
2959.33	2h	3h
2959.718	2	2
2959.808	2	1
2960.296	4cw	3cw
2961.163	3c	4c
2961.144	----	3c .18*Wl*
2961.744	20cw	15cw
2961.880	2c	2c

Wavelength	Intensity and other characteristics	
	Arc	Spark
A		
2962.266	30r	20
2962.870	15	10
2964.01	2cw	1c
2964.458	2	1
2965.112	80*R*	80c
2965.502	2	1
2965.756	150*R*	150c .15*W*
2966.416	2	1
2966.746	2c	1
2967.018	----	2h
2967.246	10	8
2967.415	8cs	10c .17*Ws*
2968.044	20c	20c
2968.330	3	2
2968.452	----	3cws
2968.975	8	9
2969.374	3	2
2969.74	4*Hw*	----
2969.778	----	5h
2970.778	----	2h
2971.596	----	1h
2971.734	----	2h
2971.802	2h	2h
2972.102	5c .15*Ws*	4cs
2974.44	----	4c
2974.563	1c	10cw
2974.844	----	5h
2975.023	8	5
2975.250	10	10
2975.658	3c	2c
2976.294	40cw	30cw
2977.102	1	----
2977.148	----	2cw
2977.300	9c	7c
2977.844	----	3
2977.956	2	1
2978.152	20c	20c
2978.509	1h	----
2978.622	1	----
2979.345	2c	1c
2980.244	2	1
2980.306	4	3
2980.820	20cw	20c
2980.90	----	50c
2981.010	7	4
2981.350	2	1
2981.496	3c	2c
2981.702	2h	2h
2982.188	50cw	40cw
2982.948	2c	1c
2983.074	1	1
2983.996	3	3
2984.504	4c	4
2984.750	7	6
2985.207	----	3
2985.552	4	4
2985.822	----	3cw
2986.050	7d	5d
2988.19	----	1h
2988.302	1	1
2988.471	20c	20c
2988.602	3c	2c
2988.918	4	3
2990.007	2cw	1cw
2990.326	3	2
2990.433	----	3
2990.604	----	5
2990.713	1	----
2990.926	----	5h
2991.448	2	1
2991.828	6	5
2992.363	150*R*	100c
2992.746	----	10h
2992.815	10cwl	6cw
2993.178	8	7
2993.769	----	1
2994.98	----	1h
2995.118	----	3cw
2995.395	20	20
2995.69	----	6c .18*Wl*

Wavelength	Intensity and other characteristics	
	Arc	Spark
A		
2995.786	4	2
2995.946	2	1
2996.074	2	4
2996.182	----	2
2996.533	3	1
2996.842	----	6
2997.124	2	1
2997.420	4	3
2997.686	9c	6c
2997.902	4	3
2997.980	5	4
2998.550	5	4
2998.700	----	5h
2999.599	200*R*	150c
2999.947	----	4h
3000.327	2h	1h
3000.581	4	2
3000.828	----	3h
3001.137	20r	20
3001.44	----	2h
3002.250	1	1
3002.490	1	1
3002.633	3c	3c
3003.626	1	1
3004.136	20c	15c
3004.342	9	8
3005.232	4c	2c
3005.69	2*H*	2*H*
3005.975	10cw	8cw
3006.425	20	20
3007.04	7	5
3007.19	4	3
3007.62	----	7h
3008.826	----	8c
3008.984	----	2cw
3009.362	----	8c
3009.902	2cw	2cw
3010.322	----	3
3010.611	----	2c
3010.648	2cw	----
3010.825	1	1
3010.977	----	2h
3011.48	4	3
3011.92	20c .17*Ws*	15*Ws*
3012.36	----	7
3013.141	15	15
3013.857	----	2
3014.419	----	7cw
3014.939	6c	4c
3015.362	----	3h
3015.866	4c	3c
3016.015	40c .15*W*	40cw
3016.480	20cw	20cw
3016.972	6	5
3017.294	3c	2c
3017.592	4	3
3017.891	5c	4c
3018.150	2c	1c
3018.345	----	1*H*
3018.981	----	5h
3019.776	2h	1h
3021.881	15	15
3022.194	----	2c
3022.989	15c	15c
3023.573	5	5
3023.858	----	9cw
3024.111	1h	1h
3024.490	3	2
3025.058	9	7
3025.36	----	3c .19*Wl*
3026.203	4	3
3026.288	5	4
3026.555	----	15cws
3027.128	1	----
3027.958	2c	1c
3028.099	2	1
3030.446	30c	30c
3031.266	6	5
3031.358	2	1
3032.486	----	1h

TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics	
	Arc	Spark
A		
3032.792	9	7
3033.374	----------	2h
3034.552	20h	15hl
3035.522	8cwl	7cwl
3035.776	----------	3h
3036.100	1	1
3036.552	9	8
3037.222	1	----------
3037.463	4	3
3037.960	15c	15
3038.368	----------	10
3038.694	----------	1
3038.812	----------	2
3039.804	1h	1h
3040.033	20cwz	20cwz
3040.592	----------	5
3041.000	10	9
3041.272	4h	4h
3041.760	7c	4c
3041.993	6	5
3042.101	2	1
3042.292	8c	8c
3043.608	2cw	1
3044.084	10	9
3044.969	----------	7
3045.286	3c	2c
3045.732	1	----------
3045.780	----------	2h
3046.000	5	4
3046.352	2h	1h
3046.644	----------	3h
3047.252	30cw	30cs
3048.036	----------	5cw
3048.586	4	4
3049.802	8cw	6cw
3050.430	----------	5cwz
3050.814	1	1
3051.590	4	3
3052.232	5	5
3052.799	3	2
3052.884	3	2
3053.629	10	9
3053.766	3	2
3053.88	----------	1
3054.496	----------	2h
3054.899	9	8
3055.004	1	5h
3055.172	----------	3h
3055.980	10c .16Ws	10cs
3056.136	2	1
3056.454	4	4
3056.733	----------	1h
3057.538	----------	2h
3057.660	10	8
3057.852	6	5
3058.149	----------	15
3058.780	20	20
3060.319	9	9
3061.218	4c	3c
3061.608	9	9
3061.844	----------	3
3061.930	----------	4
3062.040	----------	8
3062.500	3cw	2cw
3062.636	----------	2
3062.951	1	1
3063.383	3c	3c
3063.762	----------	15
3063.984	1	1
3064.499	1	1
3064.597	7	5
3065.279	5	4
3065.576	5	4
3066.020	----------	15
3067.398	200r	100
3068.762	5	4
3069.022	1cw	1cw
3069.714	1	1
3069.942	60r	40c
3070.679	2cw	1cw
3071.104	20c	20c
3072.452	3	2
3072.708	1	1
3072.965	20	20
3073.722	3cw	2cw
3073.922	2cw	1cw
3074.102	3	2
3074.657	----------	3cw
3074.99	----------	3Hw
3075.02	8Hw	----------
3075.906	1	3
3076.142	10cWl	8cW
3076.304	5	4
3076.716	3	4
3077.44	1	1
3077.740	3	2
3077.908	5cw	4cw
3078.864	15c	15c
3079.263	1	----------
3080.048	----------	4
3080.660	----------	10
3080.922	7cwl	5cwl
3081.656	2c	2c
3082.050	----------	2h
3082.426	50c .13W	40cW
3082.772	3	2
3083.552	1h	1h
3084.210	15c	15c
3084.772	5	5
3085.344	4	4
3085.528	3	3
3086.03	3	2
3087.154	10	8
3087.36	----------	7c
3087.854	----------	6
3088.257	----------	1
3088.762	30r	20
3089.341	2	1
3089.932	10c	10c
3091.356	----------	1
3092.288	----------	10
3092.304	4	----------
3092.607	----------	3c
3093.636	20c	20c
3093.994	4	3
3094.784	3	2
3094.998	2	1
3095.060	10	10
3095.314	----------	4cw
3095.788	20cwz	20cwz
3096.312	----------	15
3096.414	7	6
3097.922	4	4
3098.262	3	2
3098.674	2cw	1c
3099.064	----------	2cw
3099.61	3c .19Wl	2cw
3099.765	3c	2c
3100.672	40R	30
3100.998	7cw	5cw
3101.555	1	1
3101.700	3	2
3101.909	2	2
3103.055	1	20
3103.260	2cW	20c .15W
3103.709	2cw	1
3104.038	2cw	1cw
3104.647	10	10
3105.082	----------	7h
3105.660	2	2
3106.180	----------	1h
3106.490	2c	1c
3106.948	----------	2h
3107.298	----------	3c
3107.436	2	1
3107.864	5c	4c
3108.808	100R	60
3109.156	----------	2h
3109.478	4c	3c
3109.576	----------	6
3109.756	8	5
3109.983	----------	2
3110.326	----------	2h
3110.860	40r	40c
3111.236	2	2
3111.564	9	8
3112.404	2	2
3112.594	1	----------
3113.205	7	5
3113.350	----------	2h
3113.740	----------	1
3114.004	----------	3cw
3114.136	----------	2
3114.370	2	1
3114.631	4	4
3114.914	3cw	2cw
3116.720	----------	2
3116.924	----------	2
3117.414	4	4
3117.561	----------	2
3117.652	----------	3 c?
3117.776	----------	5
3118.002	----------	2
3118.192	40c .15Ws	40cW
3119.192	4	3
3119.288	2	2
3119.744	2	2
3119.854	3	2
3120.244	3	2
3121.360	30c	30c
3121.733	4	3
3122.206	3	3
3122.411	1h	----------
3123.161	9	9
3123.413	3	3
3123.622	2h	2h
3124.134	----------	3h
3124.313	----------	3H
3124.956	1c	1
3125.288	2	2
3125.384	1	1
3125.518	10c	10c
3126.069	2H	1H
3126.420	1	1
3127.521	----------	2
3128.023	----------	1
3128.353	3	2
3128.944	40cw	40cw
3130.203	----------	7h
3130.432	2h	1h
3130.608	1	----------
3130.921	----------	2h
3131.270	3c	2c
3131.952	----------	20
3132.013	2	----------
3132.590	2	----------
3132.926	----------	2cw
3134.022	10	10
3134.344	2c	1
3134.438	----------	2cw
3135.068	10cw	8cw
3136.178	----------	4cw
3137.640	----------	4
3138.026	3	2
3138.663	----------	1h
3138.796	----------	6
3139.263	5	4
3139.792	10c	9c
3139.945	9	7
3140.31	1h	----------
3141.254	4c	2
3141.381	10	15
3141.718	3	2
3141.857	1	1
3142.018	2	2
3142.525	3cw	2cw
3142.646	10cw	9cw
3142.847	----------	2
3142.909	2c	1c
3143.628	2cw	1c

TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics	
	Arc	Spark
A		
3143.974	----------	1*h*
3144.86	1	----------
3145.354	----------	1*h*
3145.616	4*c*	3*c*
3146.536	10*c*	8*c*
3147.690	10*cw*	10*cw*
3147.911	3	2
3148.200	6	5
3148.699	2	1
3150.047	4	4
3150.529	6	5
3151.162	10	9
3151.402	----------	1
3151.498	----------	1
3151.636	40*cw*	40*cw*
3152.456	1	1
3152.822	2*h*	1*h*
3153.640	----------	1
3153.79	40*r*	20*c*
3154.530	3	2
3155.209	----------	1*H*
3156.372	----------	1*h*
3156.552	2*c*	1*c*
3156.827	4	3
3157.348	1*h*	1*h*
3157.712	4	3
3158.306	50*c* .15*W*	50*cW*
3158.852	----------	2*h*
3158.992	----------	2*h*
3159.312	6	5
3159.617	4*cw*	4*cw*
3160.121	1	1
3160.213	5*h*	4*h*
3161.692	----------	1*h*
3162.208	2	1
3162.485	10*cw*	10*cw*
3163.243	4	3
3163.323	----------	2*h*
3164.106	5*c*	4*c*
3164.412	----------	3*h*
3164.520	10	10
3164.864	7	7
3165.802	7*c*	6*c*
3166.476	7	6
3166.609	----------	8*h*
3166.904	7	6
3167.155	10*c*	10*c*
3167.594	5	4
3168.374	50*cw*	50*cw*
3169.097	2*c*	1*c*
3169.356	1	----------
3170.074	----------	7*h*
3170.346	2	1
3170.992	10*cwl*	9*cwl*
3171.533	----------	1*h*
3173.094	9	9
3173.242	2*h*	2*h*
3173.604	----------	2*h*
3174.610	20*c*	20
3174.776	20*cw*	20*cw*
3175.094	----------	2*h*
3175.265	----------	1
3175.367	----------	2
3176.084	2	1
3177.714	30*r*	30
3177.934	2*cw*	1*cw*
3178.176	2*cw*	1*c*
3178.488	6	5
3178.612	15	15
3179.344	----------	2*h*
3179.884	2	2*h*
3181.258	3*h*	2*h*
3181.407	----------	1*h*
3181.792	1*c*	1
3182.664	7	6
3182.869	100*R*	100*c*
3183.910	----------	2
3184.760	200*R*	150*c*
3185.574	250*R*	200*c*
3186.198	1	1
3186.292	10	10
3186.856	1	1
3187.800	6*cw*	5*cw*
3187.956	3	3
3189.750	2*c*	2*c*
3189.916	2*c*	1*c*
3190.170	20	20
3190.782	20	20
3191.112	1	----------
3192.164	1	1*h*
3192.362	20*c*	20*c*
3192.608	----------	3
3192.682	4*c*	3*c*
3192.852	----------	1
3192.982	----------	2*h*
3193.199	10	10
3193.979	1	1
3194.097	1	2
3194.497	30*cw*	30*cw*
3195.206	----------	15
3195.666	3	2
3196.354	1*c*	1*c*
3196.682	----------	1
3197.248	3	3
3197.534	2*c*	1*c*
3197.59	----------	2*h*
3198.06	----------	3*h*
3198.330	----------	3
3198.470	4*cw*	3*c*
3198.578	15	15
3199.257	----------	10*cw*
3199.486	8*c*	6*c*
3199.604	2*h*	1*h*
3200.035	20*cw*	20*cw*
3200.725	10	10
3202.224	6	4*H*
3203.560	----------	1*h*
3204.245	100*c* .22*WI*	100*cWI*
3204.682	6	6
3205.420	15*c*	15*c*
3206.470	7*cw*	5*cw*
3207.768	10*cw*	10*cw*
3208.222	9	9
3208.582	1	1
3208.662	1	----------
3208.822	2	1
3209.323	----------	3*h*
3210.564	2*c*	1*c*
3210.905	----------	5*h*
3211.752	20*c*	20*c*
3212.379	5	5
3212.938	15*cw*	15*cw*
3213.152	2	----------
3213.168	----------	6*h*
3213.486	10*c*	10*c*
3213.646	3	2
3213.890	3	3
3214.110	9	10
3214.646	2*c*	1*c*
3214.818	4	4
3214.967	----------	2
3215.078	----------	3*c*
3216.316	----------	6*cw*
3217.13	----------	10*c* .21*WI*
3218.458	----------	3*h*
3218.653	----------	5*h*
3218.264	2	1
3219.538	1*c*	1*c*
3219.712	2	1
3219.906	----------	50*c*
3220.258	----------	3
3220.466	2	1
3220.550	----------	6
3221.194	2*cw*	1*cw*
3221.836	----------	15
3221.860	2	----------
3222.180	----------	1
3222.549	1	1
3223.512	1	2
3224.260	2	1
3226.37	----------	10*hI*
3227.45	8	7
3227.48	8	7
3227.618	----------	3
3227.700	1	1
3227.76	----------	2
3227.82	----------	1
3227.918	----------	2
3228.329	6*c*	6*c*
3228.428	3	2
3228.734	15	15
3229.804	1*H*	2*H*
3230.954	2	2
3231.454	1	1
3231.983	1	1
3233.988	1*h*	1*h*
3235.312	----------	2*cw*
3235.944	30	30
3236.990	5*cw*	5*cw*
3237.513	10	10
3237.825	2*cw*	1*cw*
3238.363	4*c*	3*c*
3238.470	----------	1
3238.804	2	1
3238.938	2	2
3239.156	4	3
3239.807	1	1
3240.331	4*cw*	4*cw*
3241.023	1	1
3241.172	1	1
3241.466	10	10
3241.910	----------	10*cw*
3242.174	2	2
3242.701	1	1
3244.464	----------	15*l*
3245.472	----------	1*h*
3246.311	2	80
3247.801	2	1
3248.547	10	9
3249.021	----------	1*h*
3249.105	2	1
3250.142	----------	1*h*
3251.548	2	2
3252.259	20	20
3252.482	----------	1
3252.736	2	1
3253.186	10*cw*	8*cw*
3253.951	15*cw*	15*cw*
3254.488	----------	5*cw*
3254.886	2	----------
3254.936	----------	9*h*
3255.292	3	2*h*
3255.801	5	5
3256.286	8	7
3256.666	2*cw*	1*cw*
3256.802	----------	1
3256.868	1	1
3257.435	----------	1
3257.89	----------	2*cw*
3258.055	7*cw*	5*cw*
3258.848	40*r*	40
3259.550	50*r*	50
3260.052	1	1
3261.424	----------	5*h*
3261.559	20*c*	15*c*
3262.410	1	1
3262.768	10	10
3263.297	----------	3*h*
3263.381	4	3
3263.877	1	1
3264.090	2*cw*	2*cw*
3264.534	1*h*	1*h*
3265.598	2	1
3265.760	2	1
3266.340	2*h*	1*h*
3266.851	15*c*	15*c*
3267.596	----------	2
3268.077	15*c*	15*c*
3268.278	----------	7*h*
3268.480	10	15

TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics		Wavelength	Intensity and other characteristics		Wavelength	Intensity and other characteristics	
	Arc	Spark		Arc	Spark		Arc	Spark
A			*A*			*A*		
3268.782	1	1	3310.953	2*cw*		3355.626	4	3
3268.894	15*c*	15*c*	3311.080		9*h*	3355.903	10*cl*	9*cl*
3269.033	15*c*	15*c*	3312.288	9	8	3356.328	10	10
3270.050	7*c*	7*c*	3312.749		1	3356.462	9	8
3271.087	5*c*	4*c*	3313.105	2*c*	2*c*	3356.821	4	3
3272.780	2	1	3313.948	15	15	3358.021	10	10
3273.282	4	3	3314.52	2*h*	2*h*	3358.56	6	5
3274.354	1	1	3315.143		4*h*	3359.22	10*h*	10*h*
3274.658	3	3	3316.062	6*cw*	6*cw*	3359.818	10*cw*	9*cw*
3275.478	1	1	3316.612	1	1	3360.177	4	3
3276.060	8*cw*	7*cw*	3317.013	5	4	3360.755	1	1
3276.544	4*cw*	3*c*	3317.152	2	1	3360.879		2*h*
3277.18	4	1	3317.282		2*h*	3361.145	10	9
3277.710	20*cws*	20*cw*	3317.754		15*c*	3361.828	3	3
3278.902	3*c*	2*c*	3318.155	1	1	3362.284	2*cws*	1*cw*
3279.43	1	1	3318.316	1	1	3362.745	15	15
3279.82	1	1	3318.671	10	8	3363.025	6	5
3279.97	2	1	3318.780		30*cw*	3363.412		4*cw*
3281.248	5	5	3319.146	1*h*	1*h*	3364.58	3*cw*	3*cw*
3281.467	2	1	3319.622	1		3365.168		2
3281.850	5*c*	4*c*	3320.647	2	1	3365.732	9	8
3282.042		1	3321.124	1		3365.838	8	7
3282.318	3	15	3321.450	6*c*	4*c*	3366.180	8*cw*	8*cw*
3282.863	4	3	3322.196	9*c*	8*c*	3366.418	2*cw*	1*cw*
3283.124	4*cw*	3*cw*	3322.478	50*cws*	40*cw*	3366.892	3	2
3283.907	5	4	3324.20		1*h*	3367.298	1	
3284.454	3	2	3324.510	2*cw*	2*cw*	3367.384	1	
3285.638	8	5	3324.930	10	9	3367.482	6	4
3285.706	5	4	3325.191	1	1	3367.677	5*c*	4
3285.954	1	1	3326.086		1*h*	3367.924		10*h*
3286.636		3	3326.482	1	1	3368.132	2*h*	
3287.127	10*c*	10*c*	3326.896	5*cw*	3*cw*	3368.172		2
3287.92	3*c*	2*c*	3327.204	5	4	3368.605	8*cw*	7*cw*
3288.402	1	1	3327.712	9*c*	8*c*	3370.328	1	1
3289.396		1*h*	3328.172	4*c*	3*c*	3370.764	2	2
3289.900		1*h*	3328.418		1*h*	3370.902	8*c*	7*c*
3290.093	6*c*	3*c*	3328.874	3*cw*	2*cw*	3371.142	2*cw*	2*cw*
3290.580	1*h*	2*h*	3329.319	2	2	3372.435		2*h*
3291.139	1	1	3329.412		4*cw*	3372.98		2*h*
3292.088	3	3	3330.116	2	1	3374.150	2*c*	1*h*
3292.65	2*c*	1*c*	3331.336		4	3375.040	1*h*	1*h*
3294.834	10	10	3331.520	15	10	3376.992		2*h*
3295.168	2*c*	2*c*	3332.849	2*cw*	2*c*	3376.448	4	3
3295.76	2*hs*	2*hs*	3334.136	3*c*	2*c*	3377.619	8*cw*	6*cw*
3296.099	2*c*	2*c*	3335.364	20*cws*	20*cw*	3377.743	10	10
3296.696	15*c*	15*c*	3335.664	1*c*	1*c*	3379.063	6*cws*	100*cw*
3296.992	10	8	3336.160		1*h*	3379.700	20*c*	20*c*
3298.184		5*cw*	3337.250	2	1	3380.308	5*cw*	5*cw*
3298.535		2*h*	3337.312	2	1	3380.544	2	2
3298.662	1	1	3338.178	300*R*	300	3381.424	9*c*	8*c*
3299.143	2	3*h*	3338.574		20*c*	3381.576	2*cw*	3*cw*
3299.790		10*c*	3339.35	5*c* .21*WI*	4*cWI*	3381.794	5	4
3300.972	10*c*	7	3339.685	15*c*	15*c*	3382.646	3	2
3301.274		1	3340.304	3	3	3383.259	2*c*	1*c*
3301.595	15	15	3340.976	1	1	3383.814	1*c*	
3302.230	10	10	3342.245	250*R*	250	3384.452	30*cw*	20*cw*
3302.578	2	10	3342.652	1	1	3385.166		2*h*
3302.708	1	1	3343.092	1	1	3385.757	40*cws*	30*cw*
3302.935	2	2	3344.322	100*c*	100*h*	3386.264	2*c*	2*c*
3303.208	5*cw*	50*cw*	3345.010	4	50	3387.053	2	1
3303.595	6*cw*	3*cw*	3345.564	1	5	3387.575	2*H*	
3303.754	15	15	3346.199	40	30	3387.706		2*h*
3304.394	1		3346.606	4	4	3389.428	20	20
3304.542		5*cw*	3347.572	8*c*	7*c*	3389.767	8	7
3304.833	5*c*	3*c*	3348.292	2*cw*	2*cw*	3390.032	4*c*	3*c*
3305.156		1*h*	3348.508	1	1	3390.254	30*cw*	20*cw*
3306.484	3	2	3348.640	2	2	3390.970	1	2
3307.007	10*c*	10*c*	3349.150	2*c*	2*c*	3391.052	1	1
3307.454	1	1	3349.569		3*h*	3391.256	5*hw*	3*hw*
3307.972	2	2	3349.828	4*cw*	3*cw*	3392.376	8*c*	8*c*
3308.246	9	8	3349.916	8	7	3392.988	1	1
3308.38	1	20	3350.094	4*c*	3*c*	3394.122	8	7
3308.468		5	3351.136	2	2	3394.430	1	1
3308.54	1	20	3351.948	4	4	3395.650	2	2
3308.872	8*c*	6*c*	3352.521	1	1	3397.210	9	9
3309.164	1	1	3353.208	20*c*	15*c*	3397.686	5	5
3309.324	7	6	3353.648	1	1	3398.404	3	2
3309.585	3	3	3353.84		1*h*	3398.793	8*c*	7*c*
3309.795	1	1	3354.36		2*h*	3399.302	400*R*	300*c* .16*cW*
3310.276	2*h*	2*h*	3355.288	30*cl*	20*cl*	3399.963	2*c*	2*c*

TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics	
	Arc	Spark
A		
3400.844	3c	3h
3401.168	10*cws*	10*cw*
3402.71	----------	2*cw*
3402.97	1	----------
3403.20	1	1
3403.59	3c .22*wl*	1*cw*
3403.718	----------	20
3404.438	1	1
3404.724	80*R*	60
3405.12	1h	2h
3405.888	60c	50c
3406.388	3	2
3407.79	----------	10c .21*Ws*
3408.673	30c	20c
3409.831	15	20
3409.960	2	2?
3410.282	1	1
3410.44	1h	1h
3411.507	3	3
3411.703	----------	3
3412.701	5*cwl*	3*cwl*
3413.150	2	1
3413.744	10	10
3414.380	2	2
3414.605	2c	2c
3414.760	3c	3c
3415.900	----------	4*cw*
3417.274	----------	5
3417.767	40c	30c
3418.330	1	----------
3418.933	2	2
3419.242	5	4
3419.410	60*r*	50
3420.754	20c	15c
3421.218	1	----------
3421.582	5	4
3422.923	1h	1h
3423.17	1	1
3423.737	1*d*	1*d*
3424.620	600*R*	500c .22*W*
3425.412	3c	2c
3426.189	40*r*	50
3426.527	2	1
3426.67	1c	1c
3426.884	3c	2h
3427.61	50*cw*	40*cw*
3427.964	----------	2h
3428.513	7	6
3428.826	6	4
3429.611	----------	6h
3429.780	2	1
3430.44	1	----------
3430.80	1	1h
3431.818	4	3
3432.382	2c	2c
3432.668	5	3
3433.198	4	3
3433.557	1	1
3433.828	1*cw*	30*cws*
3434.834	----------	15h
3436.193	3	1
3436.39	1c	----------
3437.714	50c	30c
3438.589	4	4
3439.027	2c	1
3439.168	1	1
3439.67	2h	1h
3439.776	3	2
3440.173	2h	1h
3440.52	----------	2*cw*
3440.843	5	3
3441.247	15*cw*	10c
3441.692	----------	20*cwl*
3442.13	4c .16*Wl*	2c*W*
3442.407	2h	2h
3442.722	5h	3h
3442.967	10	8
3444.964	3*cw*	2c
3446.256	1	----------
3446.43	----------	30c .33*Ws*
3446.743	1	1
3447.359	2	1
3447.801	1h	1
3447.915	2	2
3449.333	15	10
3449.407	15	10
3451.880	4000*R*	3000c 6, .142*Wl*
3452.649	----------	4h
3453.280	15	10
3453.495	50c	50c
3454.006	2h	----------
3454.041	----------	4h
3454.23	----------	3h
3455.327	----------	2*cw*
3455.680	----------	3h
3455.988	----------	3h
3457.077	----------	2h
3457.246	----------	1
3457.360	----------	2h
3457.956	1	1
3458.458	2	2
3458.881	15	15
3460.465	10000*R*	7000c 6, .222*Wl*
3461.24	----------	3*H*
3461.654	1	2
3461.965	----------	4h
3463.053	2c	2c
3464.726	7000*R*	5000c 6, .189*Wl*
3465.988	10	10
3467.093	1c	1c
3467.284	----------	2h
3467.656	1h	1h
3467.960	80*cw*	80*cw*
3468.645	4	4
3470.75	2	2
3470.976	1h	1h
3471.657	2c	1c
3471.923	6c	4c
3472.071	8*cw*	6*cw*
3472.723	30	20
3472.875	7	4
3473.000	2	1
3473.467	6	4
3473.688	----------	6
3474.183	10c .20*Wl*	6c*W*
3474.700	5c	4c
3475.201	5	5
3476.031	4*cw*	3c
3476.442	30	20
3477.143	8	7
3477.920	----------	1
3478.322	----------	1
3478.491	3*cw*	3c
3478.629	4*cw*	4*cw*
3478.991	----------	2h
3479.529	2	1
3480.381	30	30
3480.852	40	40
3481.398	1h	1h
3482.233	40c	40c
3482.853	2*cw*	2*cw*
3484.365	5	4
3484.728	5	3
3485.36	----------	4*cws*
3486.183	1	40h
3487.521	4*cwl*	3*cw*
3488.013	1*cw*	1*cw*
3488.77	4*cwl*	3*cw*
3488.87	4*cw*	3*cw*
3489.850	5c .20*Ws*	4c*W*
3490.860	10c	8c
3491.433	4	3
3491.772	2c	1c
3492.372	2	1
3492.545	2c	1c
3492.953	2	2
3493.863	----------	3*Hw*
3494.06	2*cw*	2*cw*
3494.725	10	8
3495.415	1	1
3495.904	10c .21*Wl*	8c*Wl*
3496.13	3*cws*	3*cw*
3497.696	----------	7h
3498.630	----------	3h
3500.24	----------	2h
3500.32	----------	1h
3502.021	2h	1h
3502.25	----------	3h
3502.727	9c	7c
3503.056	40c	40
3503.305	4	2
3503.522	4c .21*Wl*	3c*W*
3503.748	5*cw*	4*cw*
3505.375	2	1
3505.68	----------	2h
3506.177	3	2
3506.390	10c	7c
3507.334	3c	2c
3508.626	1	1
3509.288	2*cw*	1*H*
3509.432	----------	5
3510.333	1	1
3510.61	----------	2h
3510.889	10c	8c
3511.343	4*cwl*	4*cw*
3512.280	20c .23*Wl*	15c*W*
3512.65	2	1
3515.01	5c	4c
3515.756	5	4
3516.146	5c	3c
3516.646	40c	40c
3517.326	60c	50c
3518.245	----------	2h
3520.723	15c .19*Wl*	10c*W*
3521.041	1	----------
3521.507	3	2
3521.746	4	3
3522.171	6	4
3522.321	8c	6c
3522.528	4c	3c
3523.170	----------	6
3523.779	2h	1h
3524.539	4	3
3524.736	3*cw*	2*cw*
3525.259	3	2
3525.64	----------	1h
3526.21	2h	1h
3526.368	3	1
3526.734	20	10
3527.118	----------	5h
3527.229	2	1
3528.214	4c	2c
3528.516	1	----------
3529.213	15	10
3529.545	2	1
3529.74	4	2
3529.81	5	3
3530.41	----------	3h
3530.893	4*cw*	3*cw*
3531.795	2*cw*	1*cw*
3532.69	2*H*	3*H*
3533.412	2	----------
3533.503	----------	2
3534.245	4c	2c
3534.822	20	15
3535.30	1	----------
3536.157	5	3
3536.88	1*cw*	1*cw*
3537.462	50*cwl*	40*cw*
3537.69	----------	3h
3538.36	----------	4h
3538.784	2	2
3539.022	1	1
3539.329	20	15
3539.813	----------	80h
3539.944	10c	6c
3540.223	1	1
3541.340	3c	2c
3542.735	----------	30h
3543.688	5	3

TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics	
	Arc	Spark
A		
3544.277	----------	3
3544.370	4	3
3544.666	2*cws*	1*cw*
3545.41	----------	2*h*
3546.33	----------	3*cw*
3546.466	4	2
3547.024	3	2
3548.106	8	4
3549.319	5	3
3549.891	50	30
3550.644	2	3
3551.294	40*cws*	20*cw*
3551.58	10*c* 3, .14*W*	5*cW*
3553.078	2*c*	1
3353.50	3*cw*	2*cw*
3553.650	20*c*	10*c*
3556.935	----------	7*h*
3557.93	----------	5*H*
3558.15	----------	4*H*
3558.935	30*cw*	20*cw*
3559.239	1	1
3559.407	6	3
3561.078	2	1
3561.140	3	2
3561.83	----------	2*h*
3562.454	10*c*	6*c*
3562.634	----------	2*h*
3563.233	3	2
3563.653	3*cwl*	1*cw*
3564.280	----------	2*h*
3564.732	20	10
3565.195	5	3
3565.706	1	----------
3566.213	3*c*	2*c*
3566.373	2	1
3566.816	4	2
3566.964	4*cwl*	2*cw*
3567.600	1	----------
3568.234	30*cwl*	15*cw*
3568.780	2*c*	1*c*
3569.27	----------	2*H*
3570.255	30	20
3570.485	1	----------
3571.052	2*c*	----------
3571.694	8*c*	6*c*
3571.857	1	----------
3572.213	2	1
3572.804	8	4
3572.961	2*cw*	1*c*
3573.263	----------	3*h*
3573.730	3*cl*	2*c*
3574.75	----------	2*H*
3575.10	----------	4*Hw*
3575.197	2*c*	1*c*
3576.93	----------	2*Hw*
3577.09	1	----------
3577.325	6	2
3577.923	1	1
3578.054	2	1
3578.690	2	1
3578.977	2*c*	1*c*
3579.125	60*c*	30*c*
3580.15	10*c* .16*Wl*	300*cW*
3580.970	50*c*	30*c*
3581.434	----------	6*h*
3583.02	80*cws*	50*cw*
3583.146	7	3
3585.030	15*cwl*	10*cw*
3585.329	10*d*	4*d*
3586.538	2*h*	1*h*
3586.842	1	1
3588.628	1*c*	----------
3589.264	2*c*	1*c*
3590.878	10	5
3591.86	1	----------
3593.388	10*cs*	4*c*
3593.91	----------	10*cwl*
3595.164	15*c*	8
3595.32	2*h*	1*h*
3595.600	1	1
3595.887	2*c*	1*c*
3596.230	10*c*	5*c*
3596.392	20	10
3597.039	3	2
3598.767	15	8
3600.803	2*c*	1*c*
3601.161	1	1
3601.600	----------	3*h*
3603.795	1	----------
3604.394	15*cwl*	8*cl*
3605.25	----------	3*Hw*
3605.332	2	1
3605.971	2*c*	1*c*
3606.558	4	3
3607.232	10	4
3607.533	2	1
3608.661	10*cw*	4*cw*
3609.330	----------	2*c*
3610.492	30*cwl*	15*cwl*
3610.65	----------	2*h*
3611.01	----------	1*h*
3611.10	----------	2*h*
3611.437	2*c*	1
3611.80	----------	1*h*
3611.996	----------	3*h*
3612.774	5*c* .24*Wl*	3*cW*
3613.41	----------	2*Hw*
3613.62	----------	2*Hw*
3615.372	8*cw*	4*cw*
3615.426	4	2
3618.427	3	2
3617.085	80*c*	40*c*
3617.252	20	10
3617.859	20*cws*	10*cw*
3618.192	1*c*	----------
3619.203	1	1
3619.390	3	2
3619.83	3*Hw*	1*Hw*
3620.145	2	1
3620.230	2	1
3621.460	30*cwl*	15*cwl*
3622.183	10*c*	5*c*
3622.265	2*c*	2*h*
3623.980	5*h*	5*h*
3624.11	----------	4*h*
3625.908	20	10
3626.053	8	4
3626.80	----------	3*H*
3628.116	3*h*	2*h*
3629.200	20	7
3629.694	3*h*	1*h*
3630.69	2*h*	1*h*
3632.154	2	1
3632.615	1	1
3635.352	----------	3*h*
3636.772	4	2
3637.064	40	20
3637.228	10	5
3637.732	15	5
3637.848	60	40
3639.12	10*Hw*	5*Hw*
3640.75	----------	7*h*
3641.202	2	1
3642.986	15	5
3643.712	4	3
3644.924	3	2
3645.33	5*c* .18*Ws*	2*cWs*
3645.590	8	3
3646.636	5	2
3646.69	1	1
3647.544	----------	10*hc*
3649.210	2*c*	1
3649.47	6*c*	3*c*
3651.656	20*c* .16*Wl*	10*cW*
3651.972	80*c*	40*c*
3652.29	2*c*	1
3652.563	2	1
3653.17	3*H*	----------
3653.621	15*c*	5
3654.366	4*c*	2*c*
3654.935	8*c*	4*c*
3656.230	2*c*	1*c*
3656.834	----------	7*h*
3658.084	----------	10*hws*
3658.735	7*cw*	3*c*
3660.162	2	4
3660.17	----------	3*h*
3660.515	20*c*	10*c*
3662.126	10	5
3663.084	5	3
3665.251	2	1
3665.522	2	1
3667.33	----------	2*h*
3668.496	----------	7*h*
3669.159	3	2
3669.436	8	4
3669.778	40*c*	20*c*
3669.993	7*cws*	2*cw*
3670.358	10*c*	6*c*
3670.528	50	30
3672.407	20	10
3673.54	----------	2*h*
3673.868	2*c*	1*c*
3674.182	2	1
3674.87	----------	15*cw*
3675.093	3	1
3676.000	15	8
3676.570	4	2
3677.722	2	1
3678.392	6	3
3679.050	3*c*	2*c*
3680.206	10	6
3681.284	8	4
3681.407	2*c*	1*c*
3681.834	4*c*	2*c*
3682.155	5*c*	2*c*
3682.714	8*cwl*	3*cw*
3685.303	1*c*	----------
3685.444	2*c*	1
3685.803	----------	8*h*
3686.452	3	2
3688.646	6*c*	3*c*
3688.897	10	4
3689.26	----------	8*h*
3689.504	150*cws*	80*cws*
3689.824	1	1
3690.394	15	7
3690.547	1	1
3690.614	1	1
3691.385	20	10
3691.48	200*c*	100*c*
3692.115	10*cw*	4*cw*
3692.783	----------	10*h*
3692.808	2	----------
3693.636	----------	4*h*
3693.664	2	----------
3695.313	2	1
3695.424	----------	5*hc*
3695.600	3*c*	1*c*
3696.800	1	----------
3697.124	2	1
3697.710	20*cwl*	10*cwl*
3697.932	----------	20*h*
3698.565	----------	30*h*
3699.780	2*c*	1*c*
3700.374	10*cwl*	5*cwl*
3700.579	2*c*	1*h*
3700.684	2*d*	1*h*
3701.184	4*c*	2*c*
3702.098	5	3
3702.74	----------	2*hw*
3703.243	100	60
3703.53	1	----------
3704.450	20*c*	10
3704.842	10*cws*	5*cw*
3705.02	20*c*	10*c*
3705.686	8*c*	4*c*
3706.268	2*h*	1*h*
3707.192	----------	8*h*
3708.774	6*h*	2*h*

TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics		Wavelength	Intensity and other characteristics		Wavelength	Intensity and other characteristics	
	Arc	Spark		Arc	Spark		Arc	Spark
A			*A*			*A*		
3709.47	10c 6, .26*Wl*	5c*Wl*	3770.738	8c	4c	3830.098	2	1
3709.930	60c	30c	3771.252	2*h*	1*h*	3830.525	----------	8*h*
3710.22	----------	5*h*	3773.018	----------	15*cw*	3830.621	----------	10*h*
3710.64	2	1	3774.83	2c	1	3831.028	3c	1
3710.70	2	1	3775.460	3	1	3832.402	8*cwl*	3*cw*
3711.46	5*cw*	2*cw*	3776.300	----------	20c .24*Wl*	3832.92	----------	2*h*
3711.844	4*cw*	2*cw*	3776.70	----------	2*h*	3833.762	70c	40c
3712.10	----------	1*h*	3777.05	----------	5*h*	3834.235	100	50
3712.920	5*h*	2*h*	3777.63	20	10	3836.305	70c	40c
3713.160	10*cw*	5*cw*	3777.69	30	15	3836.786	----------	20*cw*
3714.02	2*cw*	1*cw*	3778.084	3	2	3837.088	1*h*	----------
3714.51	----------	10*h*	3778.535	2	1	3837.696	2*h*	1*h*
3714.530	1c	----------	3779.82	----------	3*h*	3837.894	2*h*	1*h*
3714.712	1c	----------	3780.357	15	7	3838.654	3c	1c
3714.995	5	2	3780.54	2	1	3839.540	----------	10*h*
3715.042	5	2	3781.864	4c	2c	3840.08	1*h*	----------
3715.702	2c	1	3782.21	----------	3*h*	3841.498	10	8
3717.285	100c .16*Wl*	50c*W*	3782.95	----------	3*h*	3843.415	60c .19*Ws*	20c*W*
3717.44	20c	8c	3784.179	15	6	3845.891	2*cw*	1*cw*
3720.860	2*h*	1	3784.496	3*h*	2*h*	3846.857	7	3
3721.146	4*cwl*	2*cw*	3785.535	2c	1c	3847.27	----------	2
3725.760	2000*R*	1000	3786.182	2	1	3847.38	----------	1*h*
3726.502	8	4	3787.192	10	6	3847.72	----------	10*Hw*
3726.68	4	2	3787.520	150*cw*	80*cwl*	3848.95	3*cwl*	2*cwl*
3725.752	4	2	3788.009	2	1	3851.988	15	8
3727.498	7	4	3788.144	3*s*	1	3852.689	5c	2c
3729.408	2*Hw*	1*Hw*	3789.212	4c	2c	3855.936	30c	15c
3729.684	1*h*	----------	3789.771	4c	2c	3856.72	----------	2*h*
3729.820	2	1	3790.33	5*Hw*	3*Hw*	3858.301	1	1
3730.08	----------	2*h*	3791.57	----------	2	3858.528	----------	5*h*
3730.596	2*H*	1*H*	3792.165	3	1	3858.584	1	----------
3730.89	----------	5*Hc*	3794.35	----------	2*Hw*	3859.328	2	1
3731.662	----------	10*Hcw*	3795.505	3	1	3859.450	2	1
3731.870	20	10	3795.800	10c 6, .21*Ws*	5c*Ws*	3860.862	9	4
3732.068	----------	5*Hcw*	3796.590	50*cw*	30*cw*	3861.647	6	2
3732.278	40c	20c	3797.586	50	30	3862.103	6c	3c
3735.01	20*cws*	10*cw*	3798.252	3	1	3863.153	5	2
3735.314	1000c	500c	3799.86	----------	2*h*	3863.768	15	7
3736.193	4*h*	2	3800.561	4*cw*	2*cw*	3863.932	4*cw*	2*cw*
3736.838	10c	5c	3800.95	2*cw*	100*cw*	3864.108	4	2
3737.697	2*h*	1*h*	3801.53	----------	1	3864.766	4	2
3737.806	1	1	3801.742	3	2	3865.126	1	----------
3738.538	1	----------	3802.113	----------	4	3865.875	2*h*	1*h*
3739.575	4c	2c	3802.21	2	1	3867.21	2*cw*	1*cw*
3739.82	----------	3*H*	3802.33	----------	2	3868.213	2	1
3740.10	200c	100c	3804.527	2c	1	3869.14	----------	1*h*
3740.414	30	10	3805.41	5*cw*	3*cw*	3869.944	100*cw*	50*cwl*
3742.257	2	200*h*	3807.193	1c	----------	3873.037	3	2
3742.334	1	60*h*	3807.433	1	----------	3873.501	----------	6*Hw*
3743.072	2	1	3807.742	40	20	3873.870	4	2
3743.194	1	1	3808.200	10*dl*	3*dl*	3875.26	100*cws*	50*cws*
3743.572	2	1	3808.640	2*cw*	1*cw*	3876.861	15c .16*Ws*	70c*Ws*
3744.53	----------	2*H*	3809.752	3	2	3878.868	20	10
3745.436	80*cw*	40*cw*	3810.098	20c	10c	3879.016	10c	4c
3746.441	1*h*	1*h*	3811.38	----------	2*h*	3880.336	2	1
3746.923	9*h*	5*h*	3812.259	20c	10c	3881.89	40	15
3749.010	5*h*	3*h*	3812.812	7c	4c	3881.97	7	3
3750.19	----------	1*h*	3814.24	----------	1*Hw*	3883.958	5c	3c
3750.666	5	2	3815.655	40c	20c	3884.888	2*h*	1*h*
3751.088	2	1	3816.294	2	1	3886.21	----------	5*h*
3751.555	1*h*	----------	3816.73	----------	1*Hw*	3887.29	----------	2
3752.15	----------	4*h*	3816.95	2*h*	1*h*	3887.488	40c	20c
3752.718	2	1	3817.539	30c .19*Ws*	15c*W*	3887.950	40c	15c
3752.864	4*cw*	2*cw*	3818.655	5c .20*Wl*	2c*W*	3888.09	4*h*	2*h*
3753.052	2*cw*	1*cw*	3819.327	1	----------	3888.92	----------	7*cws*
3753.316	1	----------	3819.627	1	----------	3889.36	2*cw*	1*cw*
3753.770	2c	1	3819.940	3c	2c	3889.962	40*cl*	15*cl*
3755.624	15	7	3820.21	1	----------	3890.309	2c	1c
3756.356	2	1	3821.43	----------	2	3890.54	1	----------
3757.00	----------	1*h*	3821.598	3*cwl*	1*cw*	3891.399	10	5
3757.622	15*cws*	7*cws*	3821.962	2*h*	1*h*	3893.48	5c .23*Wl*	2c*W*
5758.51	----------	1*h*	3823.478	3c	2c	3893.59	----------	2*h*
3759.749	2	1	3823.772	10c .18*Wl*	5c*W*	3893.914	5*cl*	3*cl*
3761.046	6*cw*	5*cw*	3825.30	----------	2*Hw*	3895.41	4c	2c
3765.08	2*h*	1*h*	3826.55	----------	2*h*	3896.110	30c	10c
3765.878	2	1	3827.04	15c 6, .24*Wl*	6c*Wl*	3896.40	1	----------
3766.480	15	5	3827.625	9*dl*	4*dl*	3898.41	2c	1
3768.260	5*h*	2*h*	3828.325	50	30	3898.50	----------	5*h*
3768.846	2*cw*	1*cw*	3829.80	20	10	3898.55	1	----------
3769.297	5*d*	2*d*	3829.83	10	5	3898.65	1	----------

TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics		Wavelength	Intensity and other characteristics		Wavelength	Intensity and other characteristics	
	Arc	Spark		Arc	Spark		Arc	Spark
A			*A*			*A*		
3900.24	----------	2*cwl*	3964.279	5*c*	3*c*	4041.305	3	1
3900.34	2*cl*	1*h*	3964.53	2*c*	1*c*	4042.78	----------	3
3900.50	3	1	3964.810	15	7	4043.10	----------	3
3900.85	6	3	3965.27	1*c*	----------	4044.798	3*c*	1*c*
3900.907	30	10	3965.59	----------	2*Hw*	4045.237	4*c*	2*c*
3901.092	20	8	3967.39	30*cw*	15*cw*	4045.94	2	1
3902.580	5	3	3967.707	2*c*	1*c*	4047.106	2	1
3902.82	3	2	3970.93	----------	1*h*	4048.99	80*c*	40*cs*
3905.12	10*cl*	5*cl*	3971.47	----------	1*h*	4050.926	10	4
3907.20	3*cw*	1*c*	3971.63	----------	3*Hw*	4051.200	2	1
3907.74	3	1	3975.374	3	1	4051.45	----------	2*h*
3908.210	40	20	3975.648	20*c*	8*c*	4052.852	3	1
3909.84	1	----------	3976.759	4*cwl*	2*cwl*	4053.36	3*c*	2*c*
3910.157	2	1	3978.620	10*Hw*	5*Hw*	4054.265	15*c*	7*c*
3910.272	2	1	3979.66	----------	2*Hw*	4054.59	1	----------
3910.59	----------	3*h*	3981.14	----------	2*Hw*	4055.330	20*Hw*	10*Hw*
3911.76	2*c*	1*c*	3981.455	7	3	4056.91	----------	10*h*
3913.49	----------	3*hw*	3982.286	7*cws*	3*cw*	4057.001	10	4
3913.924	60	30	3983.41	10*c* 6, .27*Ws*	4*cWs*	4058.68	2	1
3915.234	2*c*	1*c*	3983.91	15*cw*	5*cw*	4058.81	----------	2*h*
3915.382	----------	10*h*	3984.200	----------	50*h*	4059.753	2*c*	1*c*
3917.270	200*cw*	100*cw*	3984.254	10*H*	2*h*	4061.643	3*cw*	2*cw*
3919.076	10*cw*	4*cw*	3984.28	----------	10*h*	4061.856	30	15
3920.85	20*c* .20*Ws*	10*cW*	3984.74	2*cw*	1*cw*	4062.40	----------	4*h*
3921.759	10*c*	5*c*	3985.31	1	----------	4064.328	15*h*	5*h*
3922.274	10	5	3985.42	1	----------	4064.920	5*cwl*	3*cw*
3923.58	5*cws*	2*cw*	3987.086	5*h*	2*h*	4066.94	2*c*	1*c*
3924.090	10*c*	4*c*	3987.83	----------	2*Hw*	4067.246	2	1
3924.67	4*c* .25*Wl*	2*cW*	3987.915	4	2	4067.44	1	1
3925.038	2*c*	1*c*	3988.63	----------	3*Hw*	4069.12	----------	30*c* .26*Wl*
3925.63	2	1	3990.660	15	6	4069.18	10*c* .15*Wl*	?
3926.14	----------	2	3990.83	----------	2	4072.36	1	----------
3926.28	----------	4*Hw*	3991.033	30*cws*	10*cw*	4073.069	4*c*	2*c*
3926.522	10*c*	4*c*	3991.571	10*cw*	5*cw*	4074.01	2*c*	1
3926.85	4*cwl*	2*cwl*	3992.72	10*cws*	4*cw*	4075.09	1*h*	----------
3927.31	----------	1*h*	3993.20	----------	2*Hw*	4078.120	8	4
3927.59	30*c* .20*Ws*	15*cWs*	3994.164	4*d*	2*c*	4079.364	10*c*	5*c*
3928.364	2	1	3995.690	10*Hw*	4*Hw*	4081.432	80	40
3928.704	15	7	3996.987	3*c*	1*c*	4082.65	2	1
3929.198	6	3	4000.122	3*cws*	1*cw*	4083.365	20*cws*	8*cws*
3929.847	200	100	4001.19	8	1	4083.584	20*cws*	8*cws*
3930.48	10*c* .23*Wl*	5*cW*	4004.38	----------	3*h*	4084.77	----------	3
3930.53	6*c* .19*Wl*	3*cW*	4004.930	70	30	4085.01	----------	4
3931.201	20	10	4007.22	2	1	4085.14	----------	2
3932.538	2*c*	1*c*	4007.34	----------	2*h*	4085.67	----------	2*h*
3932.934	4*cs*	2*cs*	4008.97	1	----------	4086.31	----------	2*h*
3934.28	1	----------	4008.99	----------	2*h*	4087.89	4*cw*	1
3936.70	2	1	4009.54	----------	3*h*	4088.10	4*c* .16*Ws*	2*cW*
3936.899	100*c*	50*c*	4009.94	----------	10*h*	4088.69	1	2*h*
3937.628	2*h*	1*h*	4010.322	3*cw*	1*cw*	4089.01	5*cwl*	3*c*
3939.381	----------	5*h*	4012.26	15	5	4089.407	4*cws*	2*c*
3941.468	6	3	4014.855	4*h*	2*h*	4089.919	30*cw*	15*cw*
3941.540	8	4	4016.60	----------	1*h*	4090.59	2	1
3942.42	----------	2*h*	4016.95	1	1	4091.12	4*cw*	2*cw*
3942.562	10	5	4018.016	----------	4*h*	4092.96	----------	20*h*
3943.52	----------	1*h*	4018.40	20*c*	10*c*	4094.60	----------	1*h*
3944.344	15	7	4019.124	6*c*	3*c*	4095.30	----------	2*h*
3944.718	50*cw*	30*cw*	4020.860	----------	10*h*	4096.44	3*h*	1*h*
3945.906	150*c*	80*c*	4022.86	10*c*	4*c*	4096.94	----------	4*h*
3946.75	2	1	4022.965	60	20	4097.42	----------	1*h*
3947.428	----------	10*h*	4023.313	40*cws*	15*cw*	4099.31	2*h*	1
3950.570	15	6	4024.040	----------	5*h*	4102.16	8*Hw*	4*Hw*
3950.64	10*cw*	4*c*	4025.07	3*d*	1*d*	4103.763	3*h*	1
3951.45	2*cw*	1*cw*	4025.56	----------	2*h*	4104.422	70	30
3951.836	2*c*	1*c*	4025.614	9*c*	4*c*	4106.440	10*c* .23*Wl*	4*cW*
3952.10	----------	3*h*	4026.707	3*c*	1*c*	4106.829	5*h*	2*h*
3953.23	3*h*	1*h*	4027.124	4*c*	2*c*	4107.431	2*h*	1
3954.428	15*c*	7*c*	4028.53	30*c*	15*c*	4107.832	1	----------
3956.60	2*c*	1*c*	4029.63	60*c* .23*Wl*	30*cW*	4107.973	3	1
3957.173	3	1	4031.42	----------	20*c* 6, .46*Ws*	4108.618	10	4
3957.363	10	4	4032.143	8*c*	4*c*	4109.451	1	----------
3958.357	7	3	4032.35	----------	5*h*	4110.894	100*c* .16*Ws*	40*cW*
3959.39	10*c* 6, .35*Wl*	4*cWl*	4033.31	100*c* .18*Wl*	40*cW*	4111.672	2	1
3960.552	15*c*	7*c*	4033.63	10*c* .22*Wl*	4*cW*	4111.598	5	2
3961.036	150	80	4034.74	1*h*	----------	4112.275	3*c*	1*c*
3962.484	300*cw*	150*cw*	4037.49	50*c*	20*c*	4113.402	30*cws*	10*cw*
3963.267	40	20	4038.63	2*c*	1*c*	4114.676	3	1
3963.53	----------	3*c* .22*Wl*	4039.52	2*h*	----------	4116.30	----------	3*c* .34*Wl*
3963.707	7	3	4040.178	10	4	4120.23	----------	3*Hw*
3964.11	----------	2*Hw*	4041.11	----------	1*h*	4121.548	10	3

TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics	
	Arc	Spark
A		
4121.635	30	10
4122.738	8c	3c
4122.896	2c	1
4123.507	2	1
4123.82	2*cw*	1
4124.803	10c 6, .30*Wl*	4c*Wl*
4128.002	2	1
4128.136	2	1
4130.458	8	4
4132.277	10	5
4133.425	100c 6, .39*Wl*	40c*Wl*
4135.43	----------	2*h*
4136.45	200c .22*Ws*	100c*Ws*
4137.603	20	8
4138.532	3	1
4142.767	4	2
4144.363	200c*w*	100c*w*
4146.233	10c	4c
4146.70	----------	5c .21*Wl*
4148.276	5*h*	2*h*
4149.46	----------	5*Hw*
4149.96	50c .17*W*	20c*W*
4150.527	10	4
4150.790	2	1
4151.076	8c	1c
4152.29	10*h*	4*h*
4152.632	30c*wl*	15c*w*
4157.252	3c	1c
4159.925	20	10
4160.773	5c*wl*	3c*w*
4161.79	3*h*	1*h*
4162.36	----------	1*h*
4164.10	2c	1c
4164.32	1	----------
4165.29	----------	1*h*
4165.31	1*h*	----------
4165.94	----------	4*h*
4165.976	5c	2c
4166.408	10c*wl*	4c*w*
4168.588	15	5
4170.395	100*d*	50*d*
4172.047	2	1
4173.678	2	1
4173.978	10c	4c
4175.186	10c	4c
4176.540	10c .18*Wl*	4c*W*
4176.867	6c	3c
4177.419	2c	1c
4178.599	3	2
4179.73	3c*w*	2c*w*
4181.29	2c*w*	1c*w*
4182.902	100	50
4183.056	100	50
4184.48	2*h*	1*h*
4185.72	2*h*	1*h*
4186.26	----------	2*h*
4187.909	5	2
4188.441	2	1
4189.52	----------	2*h*
4190.782	2c*w*	1c*w*
4191.92	3*Hl*	2*Hl*
4194.668	50c*wl*	20c*w*
4195.741	10c	4c
4198.60	----------	2c*w*
4203.308	7c*w*	3c*w*
4204.525	30c*ws*	10c*w*
4204.95	----------	2*h*
4204.964	2c	1
4208.53	----------	2*h*
4210.69	----------	4*h*
4212.56	3*h*	2*h*
4213.266	30c*wl*	10c*w*
4214.974	2	1
4215.500	15	7
4221.079	200c	100c
4222.500	2c	1*h*
4223.178	15c*w*	7c*w*
4224.163	15c	5c
4227.46	2000c .32*Wl*	1000c*W*
4228.748	3c*w*	1c*w*
4230.55	1c	----------
4231.53	----------	20c .28*Wl*
4232.956	20	10
4233.275	10c	4c
4234.43	6c .24*W*	2c*W*
4234.95	10c .25*Ws*	3c*W*
4235.38	2c	1c
4236.237	20	10
4238.016	7c	3c
4238.586	15	6
4239.956	2	1
4240.18	----------	4c*w*
4241.16	40c	15c
4241.35	50	20
4241.42	50	20
4241.806	2	1
4243.85	2	1
4244.12	20c .21*Ws*	4c*W*
4246.820	40*hl*	10*hl*
4247.679	4*h*	1*h*
4248.27	----------	4*h*
4248.357	2	1
4255.10	2c	1c
4255.33	2c	1c
4255.749	20	7
4257.60	200c .24*Ws*	100c*W*
4258.68	2*h*	1*h*
4259.51	----------	2
4259.880	3	1
4260.91	6	3
4261.37	6c 6, .29*Wl*	3c*W*
4261.86	3c	1c
4263.35	3	1
4263.76	3c	1c
4264.26	2*h*	2*h*
4264.73	2*h*	1*h*
4267.97	3c .26*Ws*	2c*W*
4268.71	5c*w*	3c*w*
4269.79	3c	1c
4269.94	----------	20c .39*Wl*
4272.95	2	1
4274.34	10c .21*Wl*	6c*W*
4279.185	3	1
4280.59	6	3
4281.664	2c	1c
4282.734	10	4
4282.99	4	3
4285.55	1*h*	----------
4286.084	5	4
4286.463	10c	5c
4288.08	----------	4*h*
4289.09	----------	4*h*
4291.17	100c 6, .29*Wl*	40c*Wl*
4291.654	30c	10c
4291.80	8	3
4294.62	2c	1c
4295.97	----------	2*h*
4298.14	4c*w*	2c*w*
4298.20	3*h*	2*h*
4299.917	20	20
4301.052	4	2
4301.774	4c*w*	2c*w*
4302.11	3*d*	1
4302.28	2	1
4304.404	100c*Wl*	50c*Wl*
4304.78	2	1
4305.334	15c	5c
4308.802	4c	2c
4309.474	9c	4c
4310.41	2c	1
4311.68	----------	20*h*
4312.75	----------	3*h*
4313.31	2*h*	----------
4314.578	15	7
4315.71	20c 6, .38*Ws*	6c*Ws*
4316.18	4	2
4316.52	----------	4*h*
4317.11	5c*w*	5*h*
4317.68	2*h*	1*h*
4317.93	2*h*	1*h*
4318.585	10	6
4319.531	15	7
4324.33	3c	1c
4328.716	3	1
4329.076	3	1
4330.69	----------	9
4331.14	2*h*	----------
4331.365	3	1
4332.25	80c*ws*	30c*w*
4335.23	----------	2*h*
4335.860	9	5
4339.68	8c	2c
4340.65	----------	5*h*
4342.145	4	3
4344.65	4c .30*Ws*	1c*W*
4345.32	1	----------
4345.505	2	1
4351.72	2*h*	1*h*
4352.46	4c .26*Wl*	1c*W*
4356.29	----------	6
4357.06	10c*wl*	6c*w*
4357.96	10	?
4357.98	----------	20
4358.69	100c*wl*	60c*wl*
4359.310	7	4
4360.375	10c	3c
4361.26	4c*wl*	1c
4363.37	6c*wl*	4c*w*
4364.13	10c*wl*	9c
4364.851	9	3
4367.58	100c .21*Wl*	60c*W*
4368.67	----------	1*h*
4369.64	2	1
4369.77	4	2
4372.18	----------	10c*wl*
4373.202	5	2
4377.056	2	1
4377.44	3c	1
4378.48	2c	----------
4380.45	1	----------
4380.89	2c	----------
4381.00	----------	10c*wl*
4384.44	----------	2
4385.443	10c	4c
4386.14	2c*w*	----------
4387.404	10c*ws*	5c
4389.60	----------	10c*wl*
4391.342	100c*ws*	40c*w*
4392.122	3	1
4392.45	40c .28*Ws*	20c*W*
4394.30	80c	30c
4394.46	50c	20c
4396.089	10c*w*	5c*w*
4396.802	30	10
4399.80	8c*w*	5c
4400.92	----------	2*h*
4402.600	40c	20c
4403.683	5	3
4404.27	1	----------
4406.30	20c	6c
4406.47	30c*ws*	10c*w*
4406.89	----------	2*h*
4408.64	3c*w*	----------
4409.56	----------	3c*wl*
4410.39	2*h*	----------
4413.500	1	2
4415.822	80	80
4417.22	8	2
4417.33	10	3
4418.808	6	5
4419.86	2*h*	1*h*
4423.02	----------	20
4423.810	2	1
4425.762	2	1
4428.47	2c	5*h*
4427.67	2	----------
4427.951	7c*wl*	2c
4428.864	2*h*	----------
4429.76	----------	4*h*
4432.846	1*h*	----------

TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics	
	Arc	Spark
A		
4433.72	----------	5h
4434.24	2	----------
4434.43	----------	5h
4436.614	3	1
4440.44	20cw	10
4445.97	2hw	----------
4448.115	2	----------
4448.259	2	1
4452.68	----------	10
4453.28	2cw	----------
4453.92	20c	5c
4454.62	50c .36 Ws	20c Ws
4456.370	3	2
4456.668	6c	4c
4457.47	2	3h
4458.122	2c	2h
4459.405	3	2
4463.53	20	10
4464.627	2	1
4465.834	5	2
4467.544	15	7
4467.924	40	20
4468.38	----------	2h
4472.06	2	1
4473.23	4	----------
4473.31	----------	20
4473.60	----------	2h
4475.082	80	80
4475.73	----------	5h
4476.78	6cl	5cl
4477.642	3	2
4477.986	30c	20c
4478.386	60	40
4480.75	----------	3h
4481.32	----------	100c .50 Ws
4481.443	10	?
4483.16	----------	?l
4486.44	----------	5hw
4486.58	3h	1h
4486.991	5	4
4489.99	----------	8c
4493.460	1	5c
4494.12	3	4
4495.01	2cw	----------
4496.432	15	10
4498.378	10	6
4499.04	3	2
4502.52	4	3
4502.98	----------	6
4504.41	4	3
4505.49	----------	5
4507.035	100c	100c
4508.007	60	50
4508.39	1	----------
4511.25	----------	3h
4513.31	500c .32 Ws	500c W
4514.26	20c	10c
4515.142	7	5
4516.638	200	200
4517.774	1	----------
4518.570	3	2
4519.09	----------	5
4519.762	80c	80c
4520.97	----------	20
4522.73	400	400
4523.878	100	100
4526.009	80c	70c
4526.98	10cw	8c
4528.966	60	50
4529.950	150	150
4530.889	30	15
4531.36	1	----------
4536.014	40	30
4537.48	----------	6
4537.54	3c	----------
4539.16	5c .37 Ws	?
4539.23	?	10 Hw
4541.80	50	40
4542.89	----------	4cw
4543.98	1	2
4545.174	100	70
4545.53	10	5
4549.82	----------	3h
4551.502	4	3
4556.025	3	2
4556.820	1	2
4557.33	4cw	3c
4557.80	----------	3
4559.268	50	15
4559.682	50	50
4562.325	3	3h
4562.92	----------	7h
4563.63	7cs	6c
4564.633	4	2
4565.30	50c	30c
4565.51	60c	40c
4568.748	2h	2h
4569.75	----------	5h
4572.195	4	3
4575.935	2cw	1c
4577.27	----------	2
4577.550	3	2
4578.251	4	3
4578.93	3h	2
4580.68	100	50
4583.796	2c	----------
4584.49	----------	30c .51 Ws
4586.06	3c .18 W	2cw
4587.141	8	4
4588.821	2	1
4590.540	3	1
4591.682	20	10
4592.53	4cl	3cl
4595.263	4	4
4595.64	1	----------
4596.56	----------	100h
4597.32	5c .19 W	2c W
4598.143	6	4
4599.764	1	----------
4601.13	1h	----------
4605.73	200	100
4607.80	3cw	----------
4608.802	4	2
4609.81	1h	----------
4613.95	5	?
4614.66	50c .24 W	40c W
4616.57	30c	20c
4621.38	80	70
4623.34	5c	4c
4625.96	30c	10c
4626.50	----------	5h
4628.76	1	----------
4630.24	7cwl	?
4630.82	80cw	?
4634.41	10c .22 W	5c W
4635.78	3	1
4640.63	1h	----------
4640.94	1h	----------
4641.412	1h	----------
4642.68	2	?
4642.78	1	----------
4644.95	20cwl	10cw
4646.27	1h	----------
4647.46	10c	6c
4648.56	4	?
4649.19	1h	----------
4649.70	3	2
4650.093	3	2
4650.825	3h	2h
4651.20	1h	----------
4651.82	4	2
4652.33	100	70
4652.77	2cw	----------
4654.51	10c	----------
4654.63	----------	20hl
4656.29	2h	----------
4656.47	10c	7c
4660.51	10	5
4661.483	9	10
4662.493	60	10
4662.99	8cw	5c
4664.01	1	8
4665.217	5	4
4666.713	6	4
4668.56	----------	3h
4669.81	2c .31 Ws	----------
4673.15	----------	100c
4674.304	9	6
4675.38	2	1
4679.476	15	6
4681.89	2h	1h
4682.319	60c	30
4684.02	----------	5h
4685.05	1h	----------
4685.20	1h	----------
4685.853	20	10
4688.87	1h	----------
4690.90	----------	10h
4691.45	4h	3h
4692.80	1	1h
4693.38	8	7
4694.99	30c .27 Ws	10c W
4698.08	2h	----------
4698.38	1h	----------
4699.69	4	3
4700.440	50	20
4703.70	----------	10cw
4703.78	4c	----------
4703.91	1	----------
4705.04	60c	40
4708.570	2	1
4709.45	2	----------
4711.22	2	----------
4712.14	2	----------
4712.76	20	10
4714.78	----------	10
4719.57	----------	5h
4724.62	----------	4
4725.02	4c .36 Wl	3c W
4725.93	20	15
4727.60	80	60
4730.43	2h	2
4733.87	4	5
4739.24	----------	5h
4739.95	----------	5
4740.80	----------	8
4742.19	----------	9h
4742.84	2	----------
4743.46	4	3
4745.67	2	2
4746.24	5	5
4748.96	8	8
4748.38	80c .20 Ws	60c W
4749.03	40	30
4750.21	----------	3h
4750.99	5	5
4751.23	1	----------
4751.345	10c	10c
4752.10	4	2
4753.64	----------	10h
4758.833	40	20
4763.672	20cw	10c
4765.81	----------	8h
4766.89	2	2
4771.807	4	4
4772.04	1h	----------
4778.99	4h	7
4781.83	2h	?
4789.206	10	2
4789.60	3cw	----------
4791.418	200cw	50c
4796.895	4	1
4799.127	15	2
4799.49	9	2
4800.778	4cw	1cw
4802.28	1	----------
4805.56	2h	----------
4813.139	3	1
4814.92	2c .36 Wl	----------
4816.03	2c	1

TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics	
	Arc	Spark
A		
4820.57	20c .26*Wl*	5c*W*
4822.65	2	2
4825.11	2	
4829.87	6c .33*Wl*	1c*W*
4833.98	3c .35*Wl*	
4834.79	9*cs*	2
4835.23	1*h*	
4845.67	3	1
4846.26	3c	1c
4848.45	20c .27*Wl*	5c*W*
4849.23	1	
4852.57	7*cw*	2c
4853.73	3*cw*	10c .67*Ws*
4856.70	1*h*	
4862.539	5	1
4868.43	2	
4870.03	3*cw*	1c
4872.032	3c	1c
4872.43	2	
4874.237	2	1
4874.85	10	2
4876.929	2	
4881.278	3c	1c
4882.45	3	1
4884.10	3	1
4885.80	2	
4889.14	2000c 6, .548*Wl*	500c*Wl*
4892.222	4*cw*	1c
4896.167	10	3
4897.529	4c	2c
4899.634	6	2
4901.445	3	2
4903.73	15*cw*	2*cw*
4904.33		10*cw*
4904.75	2	
4905.93	1	
4906.208	30	4
4908.562	20	3
4909.066	4*cw*	1c
4909.71		4*cw*
4914.34	4c	1
4915.020	100	10
4917.84	6	2
4923.903	200	40
4925.99	2*h*	
4926.893	4	2
4928.585	3*cw*	1*cw*
4932.350	2	
4933.734	30*cw*	5*cw*
4935.842	15	4
4940.53	2*h*	
4943.73	8*cl*	2c
4944.867	7c	2c
4946.72	150	20
4949.82	20	3
4952.270	2	
4955.286	3c	1
4956.765	100	10
4960.42	2*h*	
4961.383	10c	3
4963.065	10*cw*	2*cw*
4969.435	10	3
4972.836	8	2
4976.932	2c	1
4980.677	7c	2c
4981.544	20	3
4984.812	5	3
4985.978	200c	20c
4987.521	5	2
4994.02	3*cw*	
4994.48	1	
4996.22	1	
4997.74	4c	1
5003.60	10	2
5006.68	1	
5008.14	6c .30*Ws*	?
5010.56	4c	1
5014.35	1	
5024.022	2	
5026.452	20	3
5027.943	15	2
5029.75	2c	
5031.57	1*h*	
5031.94	2*h*	
5036.88	1*h*	
5041.40	3*Hw*	
5042.631	7c .26*Ws*	1c*W*
5052.20	2	
5052.365	1	
5054.95	1*h*	
5056.063	10c	2
5058.557	100	9
5060.427	5	1
5063.76	5*cw*	1*cw*
5065.31	3	1
5066.60		1*h*
5067.544	2	1
5068.85	4*cws*	1c
5070.64		3*h*
5078.423	6	1
5081.573	1	
5087.65	2*h*	
5089.87	1*h*	
5090.57	6	1
5093.19	3c	1
5094.03	3c	1
5095.78	10*cws*	4*cw*
5096.50	150	10
5098.782	2	
5099.20		5c
5100.70	2	
5104.66	20c .29*Wl*	5c*W*
5105.15	10	3
5108.78	10	2
5112.265	15	3
5113.25	1	
5115.18	1	
5116.90	2	
5117.42	2c	
5120.32	30c	4c
5124.206	2*h*	
5124.597	9c	2
5126.70	20c 6, .52*Wl*	4c*Wl*
5140.058	4	1
5141.288	3	
5142.14	1*h*	
5145.593	6	2
5146.89	15c .28*Ws*	5c*W*
5156.248	15c	2c
5161.650	30	6
5165.198	5	1
5167.860	2c	
5172.370	2	1
5173.92	1*h*	
5178.891	80*cw*	10*cw*
5181.741	20	3
5185.896	3	
5186.149	2	
5186.423	1	
5196.11		2*h*
5198.915	3c .44*Wl*	
5199.89	8*cwl*	2c
5200.82	4*cw*	1c
5202.03	2	
5202.83	1c	
5203.46	2	
5206.74	1*h*	
5208.08	200*cws*	20*cw*
5209.927	10	2
5210.93	1	
5214.43	5*Hw*	
5214.716	5	1
5217.49	2c	
5218.18	5*h*	
5221.124	5*cw*	2*cw*
5222.124	5	1
5222.733	1	
5223.022	1	
5224.786	10*cws*	2*cw*
5226.805	2*h*	
5229.087	1	
5231.31	1	
5234.306	20*cws*	4*cw*
5236.660	10*cwl*	3*cw*
5243.52	2c	
5244.334	10	2
5247.97	1*h*	
5248.856	30	6
5250.085	3*cw*	1c
5252.34	3	1
5255.43	1*h*	
5260.62	3	
5261.88	1	
5262.39	4*cw*	3*cw*
5262.92		5c
5264.416	4	2
5265.12	5*Hw*	2*H*
5270.95	4000c .38*Ws*	2000c*W*
5273.25	2*h*	
5275.56	1000c .50*Ws*	500c*W*
5278.245	200	20
5279.102	2	
5280.54	5c .32*Wl*	
5284.581	5	2
5286.68		5*h*
5287.92	10c .25*Wl*	2c*W*
5289.16	1c	
5292.278	4	1
5299.85	1c	
5300.75	5c	1c
5303.21	1	
5305.56	30c	10*hl*
5306.739	3	1
5309.87	2c	
5311.515	6*cw*	2*cw*
5317.275	30*cwl*	6*cw*
5318.76	1*h*	
5319.23	2*h*	
5321.278	40c	6c
5321.534	2	1
5324.50	2	
5325.00	4c .53*Ws*	
5327.46	200	10
5331.896	50*cwl*	5*cw*
5332.47	2*h*	
5332.76	9c	7*hl*
5333.85	20	5
5338.63	3c	
5339.416	4	
5342.37	3*Hw*	
5343.70	3*Hw*	
5345.221	2	
5349.245	3	
5350.46	4c .39*Wl*	1*cw*
5352.64	1*h*	
5353.35	2*h*	
5353.73	1	
5356.65	1*h*	
5366.664	2	1
5369.480	30	7
5369.797	30	5
5374.720	4	1
5377.10	200c .32*Ws*	30c*W*
5378.163	5c	1c
5379.707	3	1
5390.18	1*h*	
5396.50	9	3
5402.19	2*h*	2*h*
5409.52	1	
5410.61	2*cw*	
5417.78	5*Hw*	
5418.37		5*h*
5423.29	2	1
5423.60	4	1
5423.81	6	2
5431.90	30c	10*hl*
5437.03	10	2
5437.41	3	1
5443.31	2*h*	
5444.50	1*h*	

TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics	
	Arc	Spark
A		
5447.92	15	3
5456.316	4*cs*	1*c*
5458.92	2*h*	
5460.644	30*c*	4
5465.43	7	4*h*
5467.54	3	1
5470.910	3*c*	1*c*
5475.86	1*h*	
5481.003	5	1
5492.19	3*cl*	
5494.34	2*c*	
5495.69	2*cw*	
5499.79	1*h*	
5501.921	5	1
5505.60	3*cw*	
5505.81	1	
5506.492	2	
5514.99	2*cw*	
5519.53	4*cw*	1*c*
5520.05	10*c*	5*c*
5521.10	15	4
5521.83	2*h*	
5523.40	8*c* .35*Ws*	3*cW*
5524.25	2*h*	
5529.96	2*h*	
5532.676	50*cw*	10*cw*
5534.35	1*h*	
5535.94	2*h*	
5545.15	2*h*	
5557.21	7	2
5563.24	100*cws*	10*cw*
5564.12	7	2
5570.40	1*h*	
5573.47	30*cw*	5*cw*
5577.69	8*cws*	1*cs*
5578.38	3*c* .62*Wl*	
5580.77	2	
5582.89	2	
5584.718	30*c*	5*c*
5592.68	2*c*	1
5594.856	6*c*	1
5601.92	3	
5604.15	2*h*	
5607.21	8*c*	2
5607.41	3*c*	
5608.803	3*h*	2*h*
5610.516	3	1
5612.269	10*cws*	5*hs*
5614.85	2*c*	
5619.76	4	1
5621.22	1	
5624.625	3*h*	2*h*
5625.441	8*cw*	3*cw*
5635.45	3	2
5644.467	3	1
5653.018	8	2
5658.68	4	1
5662.83	5*c* .33*Ws*	1*cW*
5664.69	3	1
5665.01	3*cw*	1
5667.88	100	20
5671.04	3*c*	?
5672.68	3*cw*	?
5678.34	3*c* .41*Ws*	
5680.92	4*c*	1
5683.40	2*h*	
5684.31	2	1
5686.81	2*cw*	
5689.75	6*c* .20*W*	1*cW*
5692.46	2*cw*	
5706.48	6*h*	3*h*
5711.426	30	3
5714.02	5	1
5716.950	15	2
5725.626	9	2
5727.90	3	1
5730.96	1	
5732.25	2*cw*	
5733.06	5*cwl*	1*c*
5734.26	5*cws*	1*c*
5734.79	2	
5736.27	2	
5737.32	2*c*	
5738.17	3*Hw*	
5739.445	7	1
5740.32	10*c* 6, .64*Wl*	2*cWl*
5749.86	2*h*	
5752.93	200*cw*	20*cw*
5763.41	3*cw*	
5769.82	2*h*	
5773.32	1*h*	
5776.83	300*c* .47*Wl*	20*cW*
5778.16	1	
5778.343	3	
5782.58	7	2
5783.01	2	
5788.10	5	1
5786.27	7	1
5791.595	20	4
5796.262	2	
5805.77	2*cw*	
5806.97	10	2
5807.41	4*cw*	1*cw*
5808.86	8*cw*	2*cw*
5810.82	4*c* .40*Wl*	
5815.92	20*c* .25*Wl*	2*cW*
5818.07	2	
5818.28	2	
5827.37	1*h*	
5834.31	1000	200
5835.52	5*c* .50*Ws*	
5844.96	2*c*	
5852.02	20*c* .52*Wl*	4*cWl*
5852.76	3	
5856.58	3	1
5868.05	8	1
5870.71	2	
5872.557	1	
5885.65	1*h*	
5899.25	8*c* 6, .55*Wl*	1*cWl*
5903.99	7*c*	
5908.01	3*Hw*	
5909.99	5*c*	1
5911.14	5*cl*	1
5916.66	4*cwl*	
5919.86	9*cs*	2*c*
5925.08	2*h*	
5927.38	6*cws*	1*c*
5938.83	2*h*	
5943.24	100*c*	10*c*
5945.46	2*c*	
5947.57	2*h*	
5950.21	10*cw*	3*c*
5954.308	4*c*	1
5956.10	4*cs*	1*c*
5967.626	5	2
5969.77	20*cwl*	5*c*
5972.58	4*c*	1
5981.65	6*c*	2*c*
5982.67	8	2
5983.14	1	2
5989.99	8*cs*	2
5995.73	20*cw*	5*c*
6021.83	2*h*	
6026.53	3	
6026.60		5*h*
6028.87	2*h*	
6029.16	2	
6030.67	3*cw*	
6036.32	3*c*	
6039.67	10*cwl*	2*cw*
6051.19	5	1
6067.39	2*Hw*	
6068.42	2*h*	
6081.57	2*h*	
6097.20	2*h*	
6114.22	60	6
6125.47	10	2
6132.98	6*cw*	2*c*
6145.81	100*cwl*	15*cw*
6146.82	80*c*	10
6169.51	6	2
6169.70	3	
6176.57	10*cwl*	3*cw*
6181.71	3	1
6187.92	4*c*	1
6191.17	2	
6195.44	15*cwl*	3*c*
6200.734	3	1
6203.24	20*c*	4*c*
6217.97	50*c*	6
6218.74	4*cl*	1
6229.42	60*c* .50*Ws*	10*cWs*
6243.24	80*c* .60*Ws*	15*cW*
6247.44	2	
6247.70	3	1
6252.08	2	
6253.03	5	1
6254.96	1	
6255.21	1	
6260.025	20	2
6260.238	40	4
6265.07	4*cs*	1*h*
6271.37	30*c* .39*Ws*	4*cW*
6272.14	3*cw*	
6278.76	30	4
6286.41	15*cwl*	2*c*
6290.11	6*c*	1*c*
6298.35	2*c*	
6303.42	10	2
6305.97	1*h*	
6306.19	2*h*	
6307.70	400	60
6307.91	200	30
6321.90	800	100
6332.24	2*h*	
6340.65	2*cw*	
6350.64	300	20
6350.87	200	10
6362.69	2	
6362.94	3	
6373.47	10*cs*	2*c*
6374.81	10*c* .48*Wl*	2*cW*
6378.60	2	
6382.94	15*c*	3*c*
6401.22	2*cw*	
6402.74	2*h*	
6405.98	20*c* .46*Ws*	2*cW*
6409.14	2*cw*	
6411.47	20	2
6416.13	2*h*	
6420.44	2*h*	
6422.24	2*h*	
6427.88	2*c*	
6436.69	3	
6449.28	8*cs*	
6462.55	2	
6501.17	5	
6502.22	7	
6510.78	3*c*	
6511.47	80*c*	
6515.25	20	
6529.21	7	
6531.11	2*h*	
6544.91	10	
6545.72	8	
6554.66	4	
6557.67	10*cws*	
6577.11	70*cws*	
6586.21	2	
6592.52	100*c* .48*Ws*	
6605.05	150*c*	
6605.33	100*c*	
6612.53	4	
6623.91	100*c*	
6637.25	30*c* .40*Wl*	
6649.02	4*Hw*	
6652.39	200*c* .53*Wl*	
6658.74	5	
6665.32	20*c* 6, .74*Wl*	

TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics	
	Arc	Spark
A		
6675.28	8*cws*	
6683.28	20*cws*	
6688.75	7*cw*	
6707.76	5*cw*	
6711.30	10*cs*	
6717.23	2	
6723.19	2	
6723.55	3*h*	
6724.98	6*c*	
6751.22	100	
6761.19	10*cw*	
6791.30	1	
6791.43	1	
6799.59	6*c* .44*Wl*	
6801.66	5	
6805.35	5*cw*	
6811.37	4	
6813.41	300*cwl*	
6816.41	2	
6829.90	300*cws*	
6835.35	3*Hw*	
6844.06	5	
6844.44	5	
6874.35	8*cw*	
6882.11	3*c*	
6929.62	2*cl*	
6963.50	3*cw*	
6967.67	8*cws*	
6971.53	200*cw*	
6971.98	7*cw*	
6976.67	2	
6985.20	20*c* 6, .63*Wl*	
7008.63	150*c* .46*Wl*	
7012.56	5*c* .53*Wl*	
7024.15	200*c* .37*Wd*	
7028.47	7*c* .33*Ws*	
7058.24	10*c*	
7059.98	6*c*	
7065.39	3	
7066.47	10	
7093.01	2*cw*	
7119.01	5*Bl*	
7128.98	4	
7129.45	7*c* 6, .70*Wl*	
7135.28	10	
7172.20	10	
7188.04	2	
7198.25	4	
7228.03	20	
7233.90	3*cw*	
7237.26	4*l*	
7246.49	150	
7246.80	100	
7263.86	4	
7265.43	5	
7273.84	150*c* .65*Wl*	
7292.72	300*c* .57*Wl*	
7307.55	5*c*	
7315.91	3	
7324.20	7	
7329.37	6	
7352.04	50*c* 6, .70*Wl*	
7360.95	4*hl*	
7382.67	3*cw*	
7384.07	1	
7386.35	20*c*	
7390.71	4*c* .64*Ws*	
7396.04	2*c*	
7404.28	3*h*	
7409.46	20	
7416.44	3*c*	
7431.93	2	
7437.79	2	
7440.69	4	
7442.75	1	
7447.58	4	
7478.63	5	
7481.15	7*c*	
7488.12	3*c*	
7489.10	2	
7494.02	2	
7524.48	10*Hw*	
7526.49	3*c*	
7536.40	2	
7545.39	5*c* .64*Wl*	
7548.72	30	
7567.80	6	
7578.73	300*c* .40*W*	
7583.26	10*c* 6, .70*Wl*	
7596.30	2	
7611.89	100	
7620.25	200*c* 6, .81*Wl*	
7640.94	400*c* .70*Wl*	
7652.3	5*Bl*	
7658.80	7	
7683.45	2	
7684.83	3	
7693.41	6	
7693.70	10*c*	
7705.92	30*c* .40*W*	
7712.58	2*c*	
7733.61	30	
7743.08	5	
7743.29	4*c*	
7789.75	7	
7789.96	10	
7794.67	5	
7799.58	3	
7801.05	4*c*	
7825.85	20	
7828.13	10	
7844.14	10*c* .40*Wl*	
7861.82	7	
7869.62	100*c* 6, .93*Wl*	
7880.56	2	
7880.78	3	
7882.11	20*c* 6, .60*Wl*	
7888.90	9	
7898.46	40	
7912.94	400*c* .60*W*	
7938.57	9	
7970.87	20	
7971.24	30	
7979.03	10	
7980.77	300*c* 6, .73*Wl*	
7985.26	3	
8004.63	4	
8024.07	2	
8027.50	4	
8052.47	2	
8055.96	5*c*	
8060.10	30*c*	
8098.27	15	
8166.63	6*c* .57*Wl*	
8224.31	3*cw*	
8246.93	4	
8253.24	2	
8253.57	2	
8262.72	5*c*	
8262.98	5*c*	
8273.56	3*h*	
8293.73	20	
8301.01	20*c* .38*Ws*	
8335.44	3	
8354.00	2	
8357.58	40*cws*	
8399.78	10*c* .42*Wl*	
8403.58	3	
8411.59	3*h*	
8417.13	500	
8433.70	3	
8503.35	3*c*	
8507.73	6*cws*	
8527.73	500*c* .67*W*	
8537.38	2	
8570.69	15	
8588.50	5*cw*	
8593.60	5	
8603.86	6	
8628.44	5*Hl*	
8630.60	7*Hw*	
8643.59	20*cw*	
8648.98	20*c* 6, 1.25*Wl*	
8675.65	40*c* 6, 1.11*Wl*	
8680.33	3	
8683.74	10	
8686.94	1	
8697.25	20*c* .49*Wl*	
8721.34	4*Hw*	
8721.88	4*Hw*	
8750.44	3*h*	
8772.49	2*h*	
8786.77	40*c* .54*W*	
8792.0	2*h*	
8797.70	30*c* .62*Wl*	
8844.57	2*cs*	
8845.23	3*cw*	
8851.32	3*c* .93*Wl*	
8871.82	1	
8882.95	15*cws*	
8886.58	15*c*	
8899.2	2*c*	
8901.36	3*cw*	
8927.28	5	
8944.56	2	
8962.07	2	
8966.63	7*cw*	
8969.21	4	
8971.14	2	
8983.55	1	
8988.40	2	
8992.91	1	
8995.26	1	
9003.24	1	
9009.16	2*cw*	
9018.9	1	
9032.46	3	
9044.38	6	
9058.53	3	
9059.85	4	
9063.31	2	
9066.6	2*c*, 1.0*W*	
9070.74	5	
9081.45	4	
9083.03	2	
9102.47	1	
9123.76	1*c*	
9132.08	2*cw*	
9144.86	6*cw*	
9154.52	1	
9165.38	2	
9171.35	1*cw*	
9192.18	1	
9198.04	1	
9205.12	2*cw*	
9209.66	2*cw*	
9213.58	2	
9220.40	1	
9236.50	4	
9250.02	10	
9253.71	1	
9255.71	2*cw*	
9262.28	4	
9268.46	15*cw*	
9278.3	1*cw*	
9298.07	1	
9307.72	1	
9311.59	5	
9325.90	3	
9328.36	1	
9332.47	2*cw*	
9337.73	2*cw*	
9363.13	20*c*	
9367.59	1	
9370.87	2	
9377.02	1	
9380.24	10*c*	
9383.75	40	
9391.12	2	
9400.27	2*Bl*	

TABLE 2. *Arc and spark spectra of rhenium*—Continued

Wavelength	Intensity and other characteristics		Wavelength	Intensity and other characteristics		Wavelength	Intensity and other characteristics	
	Arc	Spark		Arc	Spark		Arc	Spark
A			*A*			*A*		
9423.45	15		9955.45	60c, 1.2*Wl*		10593.74	2*cw*	
9427.53	3		9964.90	2		10599.31	8*cw*	
9468.38	1		9970.87	1c		10610.0	2c	
9470.15	30		9976.45	4		10618.45	40c	
9481.6	1*cw*		9980.9	1c		10625.57	8	
9500.49	8		10006.4	1c		10639.45	100*cw*	
9504.34	3		10010.29	1*cw*		10654.56	2c	
9523.40	6*cw*		10019.21	7*cw*		10725.62	1	
9564.06	1		10026.96	5c		10801.55	2c	
9571.75	6*cw*		10056.81	1		10804.3	1c	
9581.12	8c		10059.56	2*cw*		10824.22	10	
9587.0	2*Bl*		10064.02	10c, 2.20*W*		10862.25	10*cw*	
9591.32	3*cw*		10127.21	1		10909.5	1	
9600.98	1		10128.78	15		10919.30	1	
9617.78	2*Bl*		10138.24	2		10933.44	2c	
9635.30	5c		10146.84	1		10942.23	3*cw*	
9685.69	1		10162.75	1		10949.4	2c	
9704.94	3		10169.85	100c, 1.08*Wl*		10962.5	1	
9710.52	50		10175.68	20*cw*		10967.6	1	
9722.76	4		10183.32	4c		11004.02	1	
9725.6	1*cw*		10191.57	1c		11042.96	2*cw*	
9748.60	3		10197.58	1c		11054.29	30	
9749.66	6		10201.86	2*cw*		11055.02	2*cw*	
9752.08	4		10206.32	20		11141.90	1	
9762.65	20		10238.26	4		11278.5	20c, 2.2*Wl*	
9790.20	1		10242.68	1		11309.97	4c	
9813.75	2		10258.42	1		11383.70	8*cwl*	
9831.35	9		10262.77	2		11453.12	3c	
9842.65	20c, 1.32*Wl*		10282.46	5*cw*		11474.23	4	
9851.88	1		10287.58	4*cw*		11499.93	5	
9872.38	15*sd*		10329.72	1		11581.4	1c	
9884.10	2*cw*		10332.55	10*cw*		11815.8	1c	
9901.72	1		10341.3	1		11788.9	1	
9903.30	5c		10349.0	4c				
9908.97	4c		10440.92	3				
9921.7	1*cw*		10464.25	10				
9937.8	1		10492.3	1				
9943.70	20		10556.54	20c				
9949.90	200c, 1.8*Wl*		10579.7	1				
9953.02	3*cw*		10589.7	1				

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