The K-Absorption Edges of Co and its Compounds.

By

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It was made clear by Lindh and others,[1] that the wave-lengths of the K-absorption edges of the chemical compounds of lower elements displace to the shorter wave-length side compared with those of the pure elements and the displacement increases with the valencies of the compounds. M. Ishino and the author[2] previously compared the K-edges of the elements Ni, Cu, and Zn mainly with those of their oxides and concluded that for the comparatively higher elements also there was the tendency of displacing to the shorter wave-length side with their valencies in the compounds. The subject of the present paper is a comparison by the photographic method of the wave-lengths of the K-edges of pure Co and two types of its compounds.[3]

The apparatus of the experiment is the same as that of the previous investigation.[2] The temperature of the laboratory is kept between 17°–19°C to avoid the displacement due to the thermal expansion of the spectrograph and the crystal. As for the edge, the author read the short wave-length limit by the comparator. The wave-lengths of the reference lines Niα_1=1654.50 x. u. and Cuα_2=1541.232 x. u. are taken from Siegbahn's "Spektroskopie der Röntgenstrahlen", 2nd Edition. The dispersions of the plates are about 15.9 x. u. per m.m. The results are tabulated in the following table.

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1. See for example. Wien-Harms: Handbuch der Experimental Physik. 24. 2. Teil 1.
2. Mem. Coll. Sc. Kyoto Imp. Univ., Ser., A, 15. (1932)
3. De Boer investigated Co and its compounds, but unfortunately this paper was unavailable for comparison. Arch. Neerl. Sc. 3 A. 10, 101. (1927)

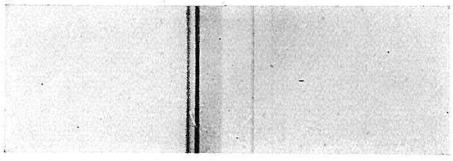
Table.

	Valencies	λ	ν/R	Δλ	$\Delta(\nu/R)$	ΔV
Co		1603.04	568.47			
$Co(OH)_2$	2	1602.08	568.81	0.96	0.34	4.61
CoS	„	1602.08	568.81	0.96	0.34	4.61
$CoSiO_3$	„	1602.49	568.67	0.55	0.20	2.71
CoF_2	„	1601.94	568.86	1.10	0.49	6.64
$CoSO_4$	„	1602.10	568.80	0.94	0.33	4.47
$CoCO_3$	„	1601.62	568.97	1.32	0.50	6.77
Mean	„	1602.05	568.82	0.99	0.35	4.74
Co_2O_3	3	1602.32	568.73	0.62	0.26	3.52

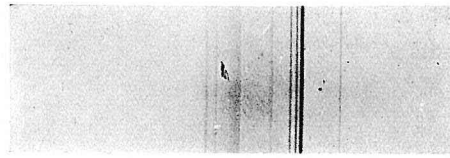
As the table shows, the mean displacement in the wave-length of the compounds of two valencies is about 1 x. u. shorter than that of the pure element. At any rate, the bivalent compounds displace, more or less, to the shorter wave-length side. For Co_2O_3, the trivalent compound, the difference in wave-length is 0.62 x. u. compared with the pure Co and is not larger than that of the bivalent compounds. This fact contradicts the generalization made above. Using the Schering-Kahlboum sample and ones made in this laboratory, the author took many photographs of Co_2O_3, but getting the same results, it was confirmed that the results were not due to any experimental error.

In conclusion the author wishes to express his hearty thanks to Prof. M. Ishino for his kind encouragement and advice throughout this work.

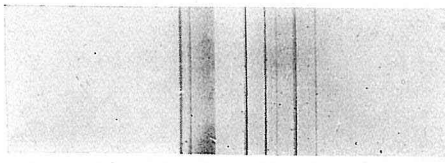
Plate



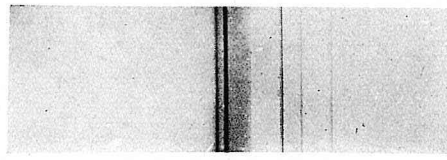
Co



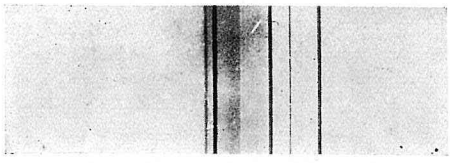
CoS



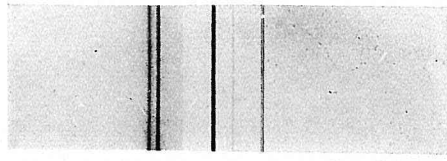
CoF



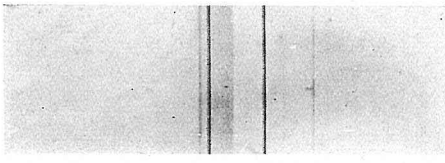
$CoSO_4$



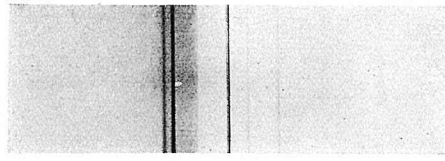
$CoCO_3$



$CoSiO_3$



$Co(OH)_2$



Co_2O_3