

Purity of Zinc for Which Thermal Diffusivity Recently Was Reported

In connection with my recent paper *A Precise Determination of the Thermal Diffusivity of Zinc* which appeared in your issue of January 15, 1933, I have received a communication from the Platt Bros. & Company in which they transmit an average analysis obtained from the producers of the zinc rod, The Bunker Hill and Sullivan Mining Company, corresponding to the time the zinc was obtained from them. Since the question of chemical analysis is of considerable importance in connection with the utilization or verification of the data which I published, I give this average analysis below, together with additional data obtained from Arthur D. Little, Inc. pertaining to the specimen which I used:

Average Analysis, Bunker Hill Brand Zinc

Cadmium	0.001 to 0.002 percent
Iron	0.003 to 0.002
Lead	0.002 to 0.003
Copper	0.001

In reference 3 of my paper I should have included a supplementary statement which Arthur D. Little, Inc. made relative to their analysis: "The impurities which we determined are the ones which are normally present in commercial zinc in appreciable amounts. It may also contain traces of copper, carbon, silicon, arsenic, antimony, sulphur, tin, silver, thallium, indium and gallium." Since the re-

ceipt of the average analysis I have had Arthur D. Little, Inc. analyze a remaining portion of the specimen, about 25 grams, for copper. The report of this shows 0.001 percent of copper. Additional information relating to the determinations of cadmium and lead is stated by Arthur D. Little, Inc. as follows:

"In the case of the cadmium determination in the zinc rod which you submitted in February, 1932, we would consider a weighable amount 0.0006 percent or more. In the case of the lead it was not practical to use such a large sample so that the degree of precision is not as great as with the cadmium. We would consider a weighable amount of the lead 0.002 percent or more.

"In the case of the cadmium we obtain an increase in weight of one-tenth of a milligram with a 31 gram sample. If this were actually calculated out it would amount to 0.0003 percent. This weight is less than the degree of precision of the average commercial analytical balance so that there was considerable question as to whether there was really any cadmium present.

"In the case of the lead we obtained no increase in weight whatever. We would therefore say that the cadmium was less than 0.0006 percent and the lead less than 0.002 percent."

R. H. FRAZIER

Massachusetts Institute of Technology,
March 31, 1933.

The Hyperfine Structure and Nuclear Moment of Cobalt

A number of the strong lines in the spectrum of Co I were excited in a Schüller tube cooled in liquid air and examined for hyperfine structure. Aluminum coated Fabry Perot etalons (since most of the important lines were in the region 3400 to 3900A) placed in the parallel beam of a two prism quartz spectrograph were used. Many of these lines showed rather a narrow overall hyperfine separation and with 5 to 10 mm invar separators were *partially* resolved into from two to six components. Before resolution was complete the orders began to overlap due in part to the large number of components which were present and also to the rather low resolving power of the etalons in this region. The fact that the dispersion of the spectrograph was not great enough to widely separate the many strong lines occurring in this part of the spectrum presented another serious difficulty.

Since these results indicated rather a high value for i , the nuclear moment of Co, those lines which arise from levels of high J value were examined. $\lambda\lambda$ 3465.8 and 3909.9 which have the same lower state $3d^7 4s^2 \ ^4F_{4\frac{1}{2}}$ originate through transitions from the levels $3d^7 4s 4p$, $^4G_{\frac{5}{2}}$ and $^6G_{\frac{5}{2}}$ respectively, and possess some of the widest h.f.s. separations. Both degrade toward the red which is in keeping with the upper level (the one containing a single $4s$ electron) possessing a wide h.f.s. separation relative to the lower level. The J values of the upper levels are both $5\frac{1}{2}$ so that $2i+1$ components would result (if $i < J$). Both lines partially resolved appear to have more than 6 components, so that i for Co is at least $5/2$ and very probably greater. Co possesses but one principal isotope of mass 59 so that

one would expect i to be half integral; assuming this and applying the interval rule to microphotometer traces of λ 3909.9 a value of $i=7/2$ gave the best agreement between the theoretical curve and that observed, however the value $i=9/2$ is not precluded. λ 3453.5, $3d^8 4s \ ^4F_{4\frac{1}{2}} - 3d^8 4p$, $^4G_{\frac{5}{2}}$ showed an h.f.s. of comparable overall separation, degrading toward the violet in keeping with the lower level having the widest separations; five components were resolved while the tail, which degraded rapidly in intensity, was broad enough to contain several components.

The results obtained therefore indicate that $5/2 < i \leq 9/2$. Widest h.f.s. separations, as is usual, were observed in those levels containing a single tightly bound s electron.

It might be worth mentioning that our results both as to the method of evaporation of aluminum and the durability of such surfaces agree completely with those of Strong, Phys. Rev. **43**, 498 (1933). The surfaces of aluminum coated etalons have remained unchanged for over six months and have been used for interferometry down to 3000A. In the region 3000-4000A they are definitely superior to similar surfaces of silver.

I would like to thank Professor H. E. White for his advice and interest during this work.

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