

therefore, if interested, is referred to the complete paper, copies of which may be obtained after about April 15, on request addressed to the Director, Bureau of Standards, Washington, D. C.

INTERFERENCE MEASUREMENTS OF WAVE-LENGTHS IN THE IRON SPECTRUM (3233 Å-6750 Å).*

By Keivin Burns, W. F. Meggers, and Paul W. Merrill.

THE wave-lengths of 403 iron lines were measured by means of interferometers. An effort was made to determine standards at intervals of about 10 Ångströms. This was accomplished in the greater part of the spectrum from 3233 Å to 6750 Å, in which region the International secondary standards exist. As far as possible, lines of all intensities were measured. These measurements probably constitute as satisfactory a group of standards as can be obtained from this portion of the iron spectrum.

The arc spectrum of iron was used in accordance with the recommendations of the International Wave-length Committee. The method of procedure was that of Buisson and Fabry.¹ Most of the wave-lengths were determined from three or more interferometers, in which the orders of interference ranged from 15,000 to 60,000 waves. The International secondary standards were used in this comparison instead of the fundamental cadmium standard. The former are the means of three independent comparisons with the primary standard, and our use of them probably gives more accurate results than could be obtained by a direct comparison with the primary standard, which would involve the corrections for atmospheric dispersion and the difficult phase change determination. The mean difference between the present observations and the International standards is about one part in four million.

Comparisons with all the grating observations of iron lines which have been made on the I. A. system prove that more secondary standards were needed to obtain the highest accuracy in grating interpolations. Some of the grating observations show a difference in wave-length which is a function of the intensity of the line. The measurements with the interferometer appear to be quite free from this effect.

* Scientific Paper No. 274.

¹ *Journal de Physique*, 7, p. 69, 1908.

Over 600 lines, including those measured, were examined by means of three or more interferometers in order to discover their limiting orders of interference. This gave an idea of the width or sharpness of each line. The data on sharpness were then correlated with intensity, pole effect, and pressure shift. Change in wave-length from the centre of the arc to the pole, or by pressure, is most likely to occur with lines which are broad even in the centre of the arc. The interferometer measurements were found to be comparatively free from pole effect. In general, the faint lines and those of moderate intensity are sharper than the strong ones, but the width of the average line, expressed as a proportion of the wave-length, appears to be constant throughout the spectrum.

**THE RELATION BETWEEN COMPOSITION AND DENSITY OF
AQUEOUS SOLUTIONS OF COPPER SULPHATE AND
SULPHURIC ACID.***

By H. D. Holler and E. L. Pepper.

[ABSTRACT.]

SOLUTIONS of copper sulphate and sulphuric acid varying in concentration from 0 to 20 per cent. of each solute were made up and their densities determined at 25° and 40° C. The solutions were made of a known composition by weight in order to avoid the influence of temperature in their preparation. The density measurements were made by weighing in the sample under investigation a sinker of known mass and volume.

The effect upon the density by the addition of definite amounts of copper sulphate to sulphuric acid solutions and of definite amounts of sulphuric acid to copper sulphate solutions is shown graphically.

The close agreement in the density of solutions of the same total concentration is also shown by the same curves.

The density of copper sulphate-sulphuric acid solutions, within the range studied, is approximately a linear function of the concentration.

A method for determining and adjusting the composition of copper sulphate-sulphuric acid solutions for electrolytic copper baths may be devised from the results of this investigation.

* Scientific Paper No. 275.