	$a : \bar{b} : c$	
$2CsCl,RuCl_3NO,2H_2O$	1.698 : 1 : 1.177	$\beta = 76°\ 11'$
$2RbCl,RuCl_3NO,2H_2O$	1.692 : 1 : 1.242	$\beta = 76°\ 50\frac{1}{2}'$

		Measured.	Calculated.	Measured.	Calculated.
		$2CsCl,RuCl_3NO.2H_2O$.		$2RbCl,RuCl_3NO.2H_2O$.	
$a \wedge c$	$100 \wedge 001$	76°, 11′*	.....	76°, 50′, 30″*	.....
$c \wedge e$	$001 \wedge 101$	30°, 0′*	.....	31°, 18′	31°, 28′, 28″
$d \wedge d$	$021 \wedge 0\bar{2}1$	132°, 45′*	.....	135°, 4′*	.....
$m \wedge m$	$110 \wedge \bar{1}10$	62°, 13′	62°, 27′, 59″	117°, 30′*	.....
$a \wedge m$	$100 \wedge 110$	58°, 45′	58°, 46′, 6″	58°, 50′	58°, 45′
$m \wedge d$	$110 \wedge 021$	33°, 18′, 30″	33°, 35′	.....	33°, 37′, 33″
$c \wedge o$	$001 \wedge \bar{1}01$	38°, 34′, 30″	38°, 53′, 23″	39°, 32′	40°, 37′, 9″
$a \wedge e$	$100 \wedge 101$	46°, 12′	46°, 11′	46°, 6′	45°, 22′, 2″
$d \wedge c$	$021 \wedge 001$	66°, 22′, 30″	66°, 30′	.....	67°, 32′
$a \wedge o$	$\bar{1}01 \wedge 100$	65°, 13′, 30″	64°, 55′, 37″	63°, 33′	62°, 32′, 21″

Both salts show a perfect cleavage parallel to *a* and a poorer one parallel to *c*. The plane of the optical axes is the clinopinacoid; the double refraction is strong, and the optical orientation such that cleavage plates parallel to *a* show in convergent polarized light an optical axis almost in the center of the field.

This investigation was made in the mineralogical-petrographical laboratory of the Sheffield Scientific School, under the direction of Prof. S. L. Penfield, to whom the author's thanks are due.

AN IMPROVED MERCURY THERMOMETER FOR HIGH TEMPERATURES.[1]

By W. Niehls.

THE ordinary mercury thermometers give accurate values up to 250° C. When the thermometer tube above the mercury is filled with nitrogen under pressure, readings are possible up to 450° C.

Early in 1893 I submitted to the Physikalisch-Technische Reichsanstalt, at Charlottenburg, Berlin, which, as is well known, tests the correctness of normal thermometers, etc., models of high temperature thermometers which were capable of giving accurate readings up to 550° C. Since then minor details of construction have been satisfactorily completed, and in the following, I will briefly describe the perfected instrument.

[1] Read before the Cincinnati Section, April 16, 1894.

At the outset it was necessary to secure a variety of glass which does not soften below 600°. For this purpose the borosilicate glass of Jena was chosen and has shown itself well adapted in all cases. The graduation is brought directly on the tube, and ranges either from 180° to 550° in single degrees, or from 100° to 550° in intervals of five degrees. The scale is black, for the sake of the greatest clearness, and the method of its preparation is as follows: The thermometer tube is supplied with the requisite amount of mercury, and then completely filled with carbon dioxide under a pressure of twenty atmospheres. In this condition the tube is heated and graduated. The mercury is then removed, black enamel is rubbed in the scale, and the tube is introduced into a muffle where the scale is brought out clearly in enamel.

This treatment in the muffle has not only the advantage of yielding a permanent scale which resists strong acids, but it also brings about an artificial "ageing" or "seasoning" of the thermometer. In other words, it decreases in a marked degree, the tendency of a thermometer to give too high readings as time goes on. This is evident from the following experimental data:

Thermometers graduated to 360°, which showed ordinarily a rise of 8°–10°, gave, after this preliminary treatment, when heated for ten hours to 340°–350° an increase of but 0.6°–0.8°. Those graduated to 400° showed, under the same conditions, a rise of 1.5°–2°. In the case of thermometers graduated to 550° the rise under the same conditions was 2°–3°. After further heating for ten hours the rise was 0.4°–0.6°. On the contrary, thermometers graduated to 550°, but not exposed to the "seasoning" treatment, showed, after being heated for ten hours, a rise of 16°–19°, and after a further period of ten hours a rise of 4°–6°, while further increase was naturally to be expected.

A further improvement of the high temperature thermometer is the coating on the back of the tube which greatly facilitates readings. This same result has been secured in the construction of ordinary thermometers by introducing into the back of the tube a strip of enamelled glass. The difference in the coefficients of expansion renders this impossible in the case of the high temperature thermometers. The strip of enamelled glass has been

replaced, however, very satisfactorily by a simple coating of enamel which is fused upon the surface of the tube at the same time that the figures of the scale are produced. The enamel on the rear of the tube, as well as that of the graduation, are totally unaffected after prolonged exposure to high temperatures.

An extended use of these thermometers is to be expected not only in laboratories, but in many branches of chemical industry, such as tar works, petroleum refineries, anilin works, etc.

I would mention in this connection the great help I have experienced in using Mahlke's "thread thermometer" for obtaining accurate readings at high temperatures. This gives the proper correction for the error due to the projection of a part of the mercury column of the thermometer outside of the substance or confined space, the temperature of which is being measured. In the case of long thermometers and high temperatures this error may reach 30°. Mahlke's thermometer is hung alongside the projecting part of a thermometer in use, and is so arranged as to give at once the reading for the number of degrees to be added to the temperature indicated in order to correct the error mentioned.

ON THE ESTIMATION OF SULPHUR IN PYRITES.[1]

BY THOMAS S. GLADDING.

THERE are two recognized methods for the estimation of sulphur in pyrites which, with various modifications, are chiefly used by commercial chemists at the present time. These are:

First, the fusion of the ore with a mixture of sodium carbonate and potassium nitrate, solution in water, filtration from iron hydroxide, and precipitation as barium sulphate.

Second, the solution of the pyrites ore in aqua regia, or in aqua regia and bromine, and subsequent precipitation as barium sulphate.

The following investigation was undertaken to determine the relative merits of these two methods and the proper modifications to be observed:

A chemically pure potassium sulphate was examined for

[1] Read before the New York Section, March 9, 1894.