XLIV. A DETERMINATION OF THE MELTING POINT OF SODIUM ELECTROLIZED THROUGH GLASS.

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While working with some electric light bulbs filled with sodium by electrolysis through the glass (see R. C. Burt, Journal of the Optical Society of America and Review of Scientific Instruments, 11, 87, 1925) we observed that the layer of sodium would break up in a characteristic way when heated to the melting point. We thought it worth while to investigate if this phenomenon could be made use of to obtain an accurate and simple determination of the melting point of the very pure sodium in the bulbs.

During the electrolysis the sodium is condensed on the glass in the narow end of the bulb. If the temperature of this part of the bulb is kept below the melting point of sodium, the outside surface of the sodium layer will form a beautiful mirror. The inner surface of the sodium will appear yellowish-white when the layer is very thin. When the layer of sodium is more than a few hundredths of a millimeter thick the inner surface will have a metallic luster much like that of silver. We did the following experiment with several bulbs containing different amounts of sodium, the outside surface of the sodium layer always forming a perfect mirror.

The bulb was held in a vertical position with the narrow end upwards and immersed in a two liter Pyrex beaker filled with water. The water was heated slowly under constant stirring, and its temperature observed by the aid of a Beckmann thermometer divided in hundredths of a degree and so adjusted that as well the boiling point of water as the melting point of sodium would fall on the scale. The outside surface of the sodium layer was observed through the wall of the beaker and the thermometer was read when the sodium surface broke up. Afterwards the Beckmann thermometer was placed in steam from boiling water, and thermometer and barometer readings taken. In this way the difference between the temperature at which the sodium layer broke up and the known boiling point of water was measured very accurately, due correction being made for the variation of the value of a division with the amount of mercury in the thermometer bulb. We found that when the layer of sodium was too thin to have metallic luster on the inner surface no observable change took place when the bulb

was heated over the melting point of sodium. When the layer was very thick the change in the appearance of the outer surface came rather gradually after the melting point was passed. With the right amount of sodium in the bulb the change was very sudden. The following values for the temperature of the breaking-up of the surface were obtained with bulbs containing nearly the most favorable amount of sodium.

96.6° C.
97.0
97.7
97.6
97.6

While the value given in the literature for the melting point of sodium vary between 92° and 98° C. the recent and most reliable values lie between 97.6 and 97.9° C. The first two of our values are evidently too low, probably due to the fact that the temperature of the bath was raised too rapidly. The mean of the three last values is 97.63° C. which is in good agreement with the most reliable previous determinations.

It seems possible to increase the accuracy of the method. We have made only five determinations because it was found difficult to obtain more than one determination with each bulb.