Demonstration of Prof. T. W. Richards's Method of Standardizing Thermometers

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LIII. *Demonstration of Prof. T. W. Richards's Method of Standardizing Thermometers.* By R. A. LEHFELDT, D.Sc.*

[Abstract.]

THIS method depends upon the ordinary latent-heat principle for maintaining constant temperature, but it includes the consideration of the fusion of systems with more than one component. If there are c components and p phases, then the number of degrees of freedom of the system is $[c + 2 - p]$. When this is zero, the temperature and the pressure of the system are perfectly definite. Thus the following formula represents the four phases to be equilibrated in the case of Glauber's salt:—

The transition point for this system is $32^{\circ}\cdot 379$ on the hydrogen scale, and can be determined to within a few thousandths of a degree.

Prof. Richards † has determined the temperature of equilibrium in several useful cases. The salts are put into a test-tube in an air-bath formed between it and a second test-tube; the whole is then heated in a beaker of water over a small flame, or, preferably, in a thermostat kept about $\frac{1}{2}$ degree above the transition point. If the salt is pure, and care is taken to avoid the effect of supersaturation, this method is highly satisfactory. It gives an extensive range of fixed-points, and is especially useful in thermometry for fixed-points between 0° and 100° . A few of these temperatures may be noted:—

Sodium chromate	$19^{\circ}\cdot 63$ C.
Sodium carbonate	$35\cdot 2$
Sodium thiosulphate	$47\cdot 9$
Sodium bromide	$50\cdot 7$
Manganese chloride	$57\cdot 7$
Trisodium phosphate	$73\cdot 3$
Barium hydroxide	$77\cdot 9$

* Read April 21, 1899.

† *Zeits. f. phys. Chem.* xxvi. p. 690 (1898), xxviii. p. 313 (1899).

DISCUSSION.

Mr. J. A. HARKER asked how long the temperature remained constant. Richards's method would appear to be a useful one for standardizing open scale-thermometers, as it would obviate the necessity for the provision of auxiliary bulbs and the 100°-point. It might also be of service as a fixed-point for meteorological thermometers.

Mr. BLAKESLEY said that sodium chromate was represented by a very useful temperature. Could this substance be regarded as sufficiently stable to give a satisfactory fixed-point?

Dr. LEHFELDT, in reply, said that the time taken by the transformation was certainly several hours. All the fixed-points mentioned were theoretically as definite as that corresponding to sodium sulphate, but they had not been so accurately determined.