LATENT HEAT OF VAPORIZATION AND SPECIFIC HEAT OF METHYL SILICATE.

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The methyl silicate was prepared by treating silicon tetrachloride with absolute methyl alcohol. The reaction proceeds according to the following equation:

This method is that employed by Friedel and Crafts¹ who first prepared this ester in the pure state. In order to get a pure product it is quite essential that the methyl alcohol be pure and perfectly anhydrous. Kahlbaum's best methyl alcohol was dried with anhydrous copper sulphate, then redistilled and treated with a small amount of metallic sodium and finally distilled once more, care being taken to exclude the moisture of the air.

The silicon tetrachloride was prepared by passing dry chlorine over hot granulated silicon. The latter product was obtained from Niagara Falls and contained notable amounts of iron. The silicon was heated in a combustion tube in a furnace to dull redness and chlorine, washed by passing it through a copper sulfate solution and then through concentrated sulphuric acid, was then passed over it. The product was condensed by means of a freezing mixture of ice and salt. The tetrachloride was purified by shaking it with mercury, and after the addition of a little sodium it was rectified. The final product boiled at 57° C under a pressure of 740 mm.

It was thought advisable to seize the opportunity to re-determine the specific heat of silicon tetrachloride and also its latent heat of vaporization.

The specific heat determinations were made by means of the well-known method of Berthelot² using a thin-walled

¹ Liebig's Ann., 136, 203 (1865).

² Mécanique Chimique, I, 275-278.

platinum bottle. The latent heats of vaporization were determined by means of Kahlenberg's method, which has been described in detail in this Journal.¹ A platinum condenser, however, was used in this case instead of one of glass.

The specific heat of silicon tetrachloride was found to be 0.1904 between 20° and 40° C. This value is the same as that recorded by Regnault.² The latent heat of vaporization was found to be 36.1 which is lower than the value found by Ogier,³ namely, 37.3.

In the determination a Beckmann's thermometer was employed, which had been carefully corrected by comparison with a Standard thermometer from the Physikalisch-Technische Reichsanstalt. As the rise in temperature was commonly two to three degrees, and as it is quite possible to incur an error of 0.005° in the estimation of this rise, the results are reliable only to about one-fourth of a percent.

In preparing the methyl silicate by the method described, the silicon tetrachloride was placed in a flask and the absolute methyl alcohol was then gradually added in molecular proportions by means of a funnel provided with a glass stop-cock. Hydrochloric acid was copiously evolved, and the flask was then gently heated to expel that gas as far as possible. The product was then subjected to fractional distillation. The fraction passing over between 120° to 123° was redistilled and a final fraction boiling at 121° at 742 mm. was employed in the determinations. The yield of methyl silicate was 94 percent.

The specific heat of the methyl silicate was found to be 0.5011 between 23° and 115° C, which is the average of several closely agreeing estimations.

The latent heat of methyl silicate at its boiling point, 121°, was found to be as follows: Three independent determinations yielded the values 46.45, 46.47 and 46.53, or an average of 46.48. The value may then be placed at 46.5.

¹ Jour. Phys. Chem., 5, 215 (1901).

² Ann. Chim. (3), 9, 322 (1843). Pogg. Ann., 62, 50 (1844).

³ Ann. Chim. Phys. (5), 20, 53 (1880).

The work done may be summarized by stating that the latent heat of vaporization and the specific heat of silicon tetrachloride have been redetermined and found to be 36.1 and 0.1904 respectively; and the specific heat and latent heat of vaporization of methyl silicate have been determined for the first time and found to be 0.5011 and 46.5 respectively.

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