TABLE II

THERMODYNAMIC DATA FOR H_2, Zn AND Cd

t	S^0 H_2	S^0 Zn(s)	S^0 Cd(s)	C_p^0 H_2	C_p^0 Zn(s)
15	31.00	9.74	12.1	6.86	6.05
25	31.23	9.95	12.3	6.86	6.07
35	31.46	10.15		6.88	6.10

pacity of zinc were taken from the equations of Kelley[5] for these elements. Entropies at 15 and 35° were computed from $S^0_{298.1}$ and the specific heat equations, corrected to conform with revised C_p^0 values at 298.1°K.[6]

The entropies of aqueous zinc and cadmium ions and the heat capacity of zinc ion are listed in Table III in calories per degree per mole. As is customary, the standard entropy and heat capacity of aqueous hydrogen ion have been considered zero at all temperatures.

TABLE III

RELATIVE ENTROPIES OF ZINC AND CADMIUM IONS. RELATIVE HEAT CAPACITY OF ZINC ION

	S^0 Zn^{++}	S^0 Cd^{++}	C_p^0 Zn^{++}
15	−25.60	−14.50	−9.05
25	−25.89	−14.82	−9.32
35	−26.21		−9.60

It is probable that the accuracy of the entropy of zinc ion is of the order of ±0.5 cal./deg. mole. The value for the entropy of cadmium ion is subject to the combined uncertainties inherent in the work of the author and of Parks and La Mer, but it is thought to be correct to about ±1 cal./deg. mole.

Latimer, Pitzer and Smith,[7] in their recent review of ionic entropies, list −25.7 ± 1 and −16.4 ± 1.5 for zinc and cadmium ions, respectively. The value for the standard entropy of cadmium ion computed from equation (4) lies just outside the limit of accuracy estimated by these authors. For zinc ion the agreement is excellent.

(5) Kelley, Bureau of Mines, Bull. 371, 1934.

(6) See footnote 23 of the paper by Owen and Brinkley, THIS JOURNAL, **60**, 2233 (1938).

(7) Latimer, Pitzer and Smith, *ibid.*, **60**, 1829 (1938).

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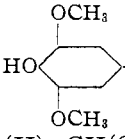
The Aldehydic Constituents from the Ethanolysis of Spruce and Maple Woods

BY LEO BRICKMAN, JAMES J. PYLE AND HAROLD HIBBERT

In accompanying communications[1] from these Laboratories the occurrence has been reported of aldehydic constituents among the ethanolysis products of spruce and maple woods. The aldehyde fraction of the latter readily yields a crystalline semicarbazone, m. p. 210–210.5°, analysis of which points to a structural formula for the aldehyde corresponding to either I, II, III, IV or V.

Anal. Calcd. for $C_{12}H_{17}O_5N_3$ (I, II, III): C, 50.87; H, 6.05; N, 14.8; OCH_3, 21.9. Calcd. for $C_{12}H_{15}O_5N_3$ (IV and V): C, 51.24; H, 5.37; N, 14.9; OCH_3, 22.0. Found: C, 51.61; H, 5.61; N, 14.7; OCH_3, 21.9.



—R where R is (I) CH_3—C(OH)—CHO, (II)—$CH(OH)CH_2CHO$, (III)—$CH_2CH(OH)CHO$, (IV)—$COCH_2CHO$ and (V)—CH_2COCHO. The experimental data are somewhat in favor of IV or V but nevertheless in good agreement with all five structures.

A similar semicarbazone has also been isolated from the ethanolysis aldehyde fraction of spruce wood and the investigation of both products is in progress.

The relation of both to the structure of lignin is discussed in the accompanying *communication* by one of us (H. H.)

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(1) Cramer, Hunter and Hibbert, THIS JOURNAL, **61**, 509 (1939); Hunter, Cramer and Hibbert, *ibid.*, **61**, 516 (1939).

The Phosphorescence of Tetraphenylmethane and Certain Related Substances

BY DANIEL B. CLAPP

Upon irradiation of solid crystalline tetraphenylmethane and certain of its derivatives with ultraviolet light from a Hanovia quartz mercury vapor cold-discharge lamp, it was noted that the substances exhibit marked luminescence after extinction of the exciting light. Tetraphenylmethane,[1] m. p. 281.5–282°, which was purified by distillation, sublimation, and recrystallization, shows a brilliant blue-green after-glow, with a visible duration at room temperature of about twenty-three seconds. The duration of the phosphorescence is dependent upon temperature; at 130° the duration is so short that no after-glow is visible; at 125° it persists for about two seconds, at 80°

(1) Prepared both according to Ullmann and Münzhuber, *Ber.*, **36**, 404 (1903), and to Schoepfle and Trepp, THIS JOURNAL, **58**, 794 (1936).