Thermodynamic Properties of Steam at High Temperatures

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I have also examined cholesterol from the spinal fluid of cattle and find a normal deuterium content.

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July 17, 1934.

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Thermodynamic Properties of Steam at High Temperatures

In a recent paper[1] I computed the thermodynamic quantities for steam from the spectroscopic data of Mecke and his associates for temperatures up to 1500°K. The calculation was not extended above 1500° since some uncertainties in the data (more particularly the change in the rotational constants for the higher vibrational states) introduced for such temperatures appreciable errors in the calculated thermodynamic quantities. Since that time, however, I have received several requests for data for the range 1500°–3000°, and I have therefore extended the calculation. The results are given in Table I.

TABLE I.

T°K	$-(F°-E_0°)/T$ cal./deg.	$S°$ cal./deg.	$C°P$ cal./deg.	$H-E_0°$ kilocal.	$E-E_0°$ kilocal.
1500	50.59	59.78	11.15	13.80	10.82
1750	52.03	61.54	11.67	16.65	13.17
2000	53.32	63.13	12.09	19.62	15.65
2250	54.49	64.58	12.4	22.69	18.22
2500	55.57	65.90	12.7	25.84	20.87
2750	56.56	67.12	12.9	29.04	23.58
3000	57.49	68.25	13.1	32.30	26.33

These entries were computed by the same formulae and with the same spectroscopic and universal constants as were the numbers below 1500°. It is rather difficult to make estimates of the probable error; it seems likely, however, that even for 3000°, a free energy based on these numbers will be reliable to 300 cal. or so, and that $(E-E_0°)$ will not be in error by more than half a kilocalorie. These data at least possess the advantage of being numerically consistent with those for lower temperatures, and should serve for making rough estimates of equilibrium constants, etc., in this range.

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