

of a nitrating mixture containing sulphuric acid in making the product soluble.

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P. HOWARD  
F. L. USHER

Department of Chemistry,  
Battersea College of Technology,  
London, S.W.11.

<sup>1</sup> Trogus, C., *Ber.*, **64**, 405 (1931); *et al.*, 408.

<sup>2</sup> Harland, W. G., *J. Textile Inst.*, **45**, T, 878 (1954).

<sup>3</sup> Bennett, C. F., and Timell, T. E., *Soensk Papperstidn.*, **58**, 281 (1955).

<sup>4</sup> Wise, L. E., and Jahn, E. C., *Wood Chemistry* (Reinhold Pub. Corp., New York, 1952).

<sup>5</sup> Davidson, G. F., *J. Text. Inst.*, **32**, T, 109 (1941).

<sup>6</sup> Gagnon, P. E., Newbold, B. T., and Thomas, J., *Tappi*, **44**, 749 (1961).

### Effect of Electric Fields on the Boiling Points of Liquids

Katti and Chaudhri<sup>1</sup> noticed that big depressions in the boiling points of some alcohols occur when large electric fields are applied to the vapour phase over the boiling liquid. We have been continuing these investigations, and our observations reported in this communication provide a clearer picture of their results. For high rates of boiling our observations are in general agreement with those of Anderson and Infirri<sup>2</sup> which have since come to our notice.

The Beckmann thermometer used by Katti and Chaudhri was replaced by a thermometer graduated in deg. C reading to a tenth of a degree. This enabled us to read the actual temperature. It was immediately noticed that with the previously used experimental arrangement the temperature recorded by the thermometer was about two to three degrees higher than the true boiling points of the liquid under investigation. It therefore appeared that under the previous experimental set-up where about 20 ml. of the liquid was boiling at a slow rate, the vapour over the boiling liquid was probably being superheated to some extent by the transformer oil which was used for keeping the electrodes submerged. There was thus a possibility that the application of a strong electric field might disturb the thermal balance by the convection currents set up by the field in the transformer oil and a drop in the temperature was recorded.

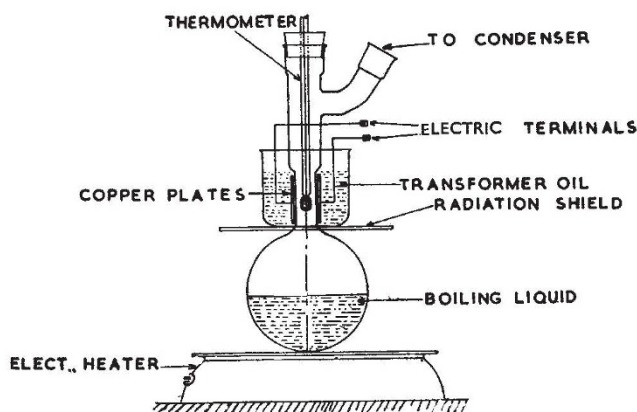


Fig. 1

In order to test this explanation we modified the apparatus, with the view of (1) obtaining the true boiling points of the liquids under investigation, and (2) rendering the losses of heat through the transformer oil insignificant compared with the effect of the boiling liquid and condensing vapour on the thermometer bulb. The modified apparatus is shown in Fig. 1 and is self-explanatory. We could boil about 120 ml. of the liquid vigorously and, at the

Table 1

Liquid	Std. b.p. corrected for lab. pressure (ref. 3)	Observed b.p. at zero field	Observed b.p. at field of 5-30 kV/cm in steps of 5 kV/cm
Benzene	79.4° C*	78.9° C	78.9° C
Carbon tetrachloride	76.0° C†	75.7° C	75.7° C
Ethanol	77.6° C*	77.2° C	77.2° C
Isopropanol	— ‡	81.0° C	81.0° C
Methanol	64.4° C*	63.9° C	63.9° C

\* Obtained from graphed values.

† Obtained from formula of the type  $\log p = A/T + B$ .

‡ Normal b.p. = 82.4° C.

same time, the temperature of the transformer oil would not be greater than that of the vapour phase. Our results with five liquids are summarized in Table 1.

Two points are to be noticed in Table 1. First, with the modified apparatus the observed boiling points were within 0.5° C of the calculated value; and secondly, the electric fields applied to the vapour phase did not change the reading of the thermometer to an accuracy of 0.1° C. These observations were made at high boiling rates. When we cut down the rate of boiling considerably, so that only a few bubbles were just breaking on the surface per second, application of the electric field reduced the thermometer reading. On switching-off the field, however, in this experimental arrangement the thermometer reading did not return to the original values, as was the case in the previous set-up, indicating that with low rates of boiling insufficient vapour was rising up the column to maintain the thermal balance.

We have now been engaged in setting up more elaborate experimental arrangements capable of yielding precise information regarding the recorded drops in the temperatures of the boiling liquids reported by us.

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V. RAMAKRISHNA  
P. K. C. PILLAI  
P. K. KATTI

Departments of  
Chemistry and Physics,  
College of Engineering and Technology,  
Hauz Khas, New Delhi, 16.

<sup>1</sup> Katti, P. K., and Choudhri, M. M., *Nature*, **190**, 80 (1961); **192**, 1285 (1961).

<sup>2</sup> Anderson, R. A., and Infirri, S. S., *Nature*, **196**, 267 (1962).

<sup>3</sup> *International Critical Tables*, **3** (McGraw-Hill, 1928).

## BIOCHEMISTRY

### Relationship between Nuclear and Cytoplasmic Ribonucleic Acid

RECENTLY, Harris and Watts<sup>1</sup> reported on the incorporation of radiocarbon derived from [8-<sup>14</sup>C]-adenine into adenine and guanine bases of nuclear and cytoplasmic RNA in logarithmically growing HeLa cells. The complex nature of curves of specific activity versus time under varying experimental conditions was interpreted by these authors as primarily due to synthesis of cytoplasmic RNA in the cytoplasm from acid-soluble precursors. Similar work carried out in our laboratory led to an entirely different conclusion. Our results were consistent with a 'partial' precursor-product relationship, in which the nuclear RNA acted as a precursor to a major fraction of the cytoplasmic RNA (unpublished results). The arguments put forth by Harris and Watts are based on qualitative evidence. This led us to evaluate their results on a more rigorous quantitative basis. The following analysis shows them to be compatible with a precursor-product relationship between the nuclear and cytoplasmic RNA.

In an ideal system of exponentially growing cells in a steady state with constant cell composition, it is assumed,