nickel, cadmium, iron, zinc and manganese was obtained with a log-log plot. The data for aluminium and titanium were greatly out of line, aluminium by two orders of magnitude and titanium by many orders of magnitude.

These experiments are being extended to include the corrosion of other metals and alloys and to include the effect on the corroding metals of contact with ruthenium, osmium, silver and gold.

This research was supported by the American Can Company. We are indebted to the International Nickel Company for lending us the platinum and the palladium and to Baker and Company for lending us the rhodium and iridium.

W. ROGER BUCK, III
HENRY LEIDHEISER, JUN.

Virginia Institute for Scientific Research,
2820 Grove Avenue,
Richmond 21,
Virginia.
March 14.

Estimation of Hydrogen Peroxide in Culture Media

THE small quantities of hydrogen peroxide produced in culture media and also by some antituberculous substances are thought to have an inhibitory effect on catalase-negative strains of *Mycobacterium tuberculosis* resistant to isoniazid^{1,2}. In studying this problem an indirect polarographic method has proved a sensitive and accurate way of estimating peroxide. Although direct polarographic estimation of hydrogen peroxide is possible in some simple media, the decomposition current of more complex media may obscure the hydrogen peroxide wave.

The indirect method depends on the measurement of oxygen released from hydrogen peroxide by the action of catalase. 10-ml. samples of media to be tested are freed of oxygen by the passage of nitrogen. Six units of Worthington catalase are added, and the oxygen-diffusion current measured³ at -0.50 V. with a recording polarograph, using a mercury dropping electrode and a saturated calomel half-cell and agar bridge. A standard curve of oxygen-diffusion current against peroxide concentration is constructed for each batch of media. The unknown concentration of peroxide is found by entering the oxygen-diffusion current in the standard curve. When only occasional observations are required Hohn's method⁴ of standard addition can be used.

With the media so far used we have found a linear relation between diffusion current and concentration of hydrogen peroxide over a wide range. For example, the regression coefficient (b) in the regression equation :

$$\log(\text{oxygen diffusion current}) = b \log(\text{concentration of hydrogen peroxide}) + a$$

for Kirehner⁵ medium, was 1.0069 (standard error 0.0125, $N = 7$) over the range 0.03–30 $\mu\text{gm./ml.}$ of hydrogen peroxide. The lower limit of sensitivity (0.03 $\mu\text{gm./ml.}$) was determined by the ultimate sensitivity of the instrument. The Kirehner medium, which contains 10 per cent horse serum, was at pH 7.5 at 22° C. The diffusion current of oxygen was 19 $\mu\text{amp.}$ for a concentration of 0.1 $\mu\text{gm./ml.}$ of hydrogen peroxide. The instrument was a Tinsley type 13 polarograph, and the capillary constant ($m^2/s_1^{1/2}$) was 2.28.

It cannot be stated that specificity of method has been proved, because peroxides other than hydrogen peroxide may be broken down by catalase to produce oxygen. However, there appears to be no evidence that other peroxides occur in significant concentration. The other peroxides which have been shown to be substrates for catalase, such as methyl hydrogen peroxide⁶, are broken down very slowly compared with hydrogen peroxide.

We believe this method should be applicable in biological systems which contain neither catalase nor an inhibitor of this enzyme.

E. J. K. PENIKETT
A. J. LISTER

Department of Bacteriology,
Guy's Hospital Medical School,
London, S.E.1.
April 18.

¹ Middlebrook, G., *Amer. Rev. Tuberc.*, **69**, 472 (1954).

² Knox, R., *J. Gen. Microbiol.*, **12**, 191 (1955).

³ Kolthoff, I. M., and Lingane, J. J., "Polarography" (Interscience Pub., Inc., New York, 1941).

⁴ Hohn, H., "Chemische Analysen mit dem Polarograph", 51 (Berlin, 1937).

⁵ Mackie, T. J., and McCartney, J. E., "Handbook of Practical Bacteriology", 9th edit. (E. and S. Livingstone, Ltd., Edinburgh, 1953).

⁶ Chance, B., *J. Biol. Chem.*, **179**, 1341 (1949).

Anomalous Behaviour of β -Diketone Complexes of the Lanthanons in Organic Solvents

THE acetylacetonates of rare earths are known¹ to possess dimeric formulæ R_2Ac_6 (where R denotes the rare earth elements and Ac acetylacetone) as determined from the rise of boiling points of their solutions in nonpolar organic solvents such as benzene, carbon disulphide, carbon tetrachloride, etc. We have found, however, that in acetone, acetylacetonates and benzoylacetonates of lanthanum and yttrium (the two salts studied) are monomeric, RAc_3 .

We find that the above complexes behave abnormally in dioxane. In this solvent, they produce lowering of boiling point instead of elevation. The cause of this anomalous behaviour is not clear. The equation² giving the elevation of boiling point produced by an appreciably volatile solute is $\Delta T_e' = K_{em} (1 - k)$, where $\Delta T_e'$ is the observed elevation of boiling point and k is the ratio of the mole fraction of solute in the vapour phase to that in the liquid phase. If k is greater than unity, that is, if the concentration of the solute in the vapour phase is greater than that in the solution, a negative elevation (depression) of boiling point may occur. But in this case, the analysis of the vapour phase indicated that these substances are only slightly volatile with the vapour of the solvent. The acetylacetonates of other trivalent metals such as aluminium, iron and chromium are more volatile, but these latter complexes behave normally in all the solvents studied, being always monomeric and producing an elevation of boiling point.

N. K. DUTT
P. BANDYOPADHYAY

University College of Science,
Inorganic Chemistry Laboratory,
Calcutta.
April 7.

¹ Biltz, W., *Annalen*, **331**, 334 (1904).

² Glasstone, S., "Text Book of Physical Chemistry", 650, 2nd edit. (Macmillan, London, 1946).