

too great an importance to the electron diffraction patterns of oxide films recorded at room temperature.

Recent application of the high-temperature method of electron diffraction to thin oxide films formed on a heat-resisting steel of the composition 0.47 per cent carbon, 0.72 per cent manganese, 1.7 per cent silicon, 12.9 per cent nickel, 13.1 per cent chromium and 3.1 per cent molybdenum, has shown that at temperatures up to 950°C. the oxide has a spinel structure. The spinel structure is possessed by a large number of oxides of the general type $XO.Y_2O_3$, and minerals are obtained in which the X positions on the lattice are shared among two or more metals, and there is also evidence that the X and Y atoms are interchangeable. Only small differences in lattice parameters are observed among the oxide spinels, and it seems, therefore, that the spinel structure is both exceedingly flexible and inherently stable. The relative instability of the $FeO.Fe_2O_3$ spinel on 'Armco' iron must be regarded as exceptional and attributable to the fact that both X and Y lattice positions are occupied by atoms of the same metal, thus making possible the $Fe_2O_4 \rightarrow FeO$ transformation. With the more general type of spinel oxide, containing at least two different metals, a corresponding change is not possible, and therefore the structure should be stable over a much wider range of temperatures. The oxide formed on nickel-chromium alloys has been shown to have a spinel structure and probably a composition corresponding to $NiO.Cr_2O_3$. There can be no doubt that in this case the spinel affords excellent protection against further oxidation at high temperatures.

In view of the foregoing, it seems reasonable to suggest that the oxidation resistance of heat-resisting steels is largely due to the formation of a stable spinel. Provided such elements as nickel, chromium and aluminium are present in sufficient quantities, the spinel structure should be stabilized and should, moreover, be able to accommodate almost any metal which may be added to the steel for the purpose of improving its mechanical properties at high temperatures. The absence of lattice changes on heating and cooling will prevent easy access of oxygen to the underlying metal surface and so greatly increase the oxidation resistance.

A. G. QUARRELL.

Department of Metallurgy,
University of Sheffield.

¹ Tokumitsu, T., *NATURE*, **145**, 589 (1940).

² Pfeil, *J. Iron and Steel Inst.*, No. 1, 501 (1929).

³ Jackson and Quarrell, Second Report of the Alloy Steels Research Committee, Special Report No. 24, Section 4, Iron and Steel Institute, 1939.

Benzanthrones

IN a previous publication¹ it was stated that, contrary to Schaarschmidt and Georgeacopol², the ring closure of *o*- α -naphthylbenzoic acid gave a mixture of *mesobenzanthrone* and 3:4-benzfluorenone.

Since then, Grieve and Hey³ have reported the same results as Schaarschmidt and Georgeacopol², without the isolation of 3:4-benzfluorenone. I had to repeat my experiments later, using different condensing agents (concentrated sulphuric acid, phosphorus pentachloride followed by aluminium chloride and phosphorus pentoxide) at different temperatures. In none of these attempts, however, was *mesobenzanthrone* obtained free from 3:4-benzfluorenone.

The condensation of diazotized methyl anthranilate with α - and β -methyl-naphthalene⁴ at 25° gave, in a poor yield, a mixture of acids and *o*-2'-methyl-1'-naphthylbenzoic acid respectively. The yield was improved by altering the condition of the reaction.

o-4'-Methyl-1'-naphthylbenzoic acid was easily prepared by condensing 4-iodo-1-methylnaphthalene with *o*-iodobenzoic ester (cf. Baddar and Warren¹). Cyclization of this acid gave also a mixture of 1'-methyl-*mesobenzanthrone* and 2-methyl-3:4-benzfluorenone.

FAWZY GHALI BADDAR.

Fouad I University,
Abbassia, Cairo.

¹ Baddar and Warren, *J. Chem. Soc.* 401 (1938).

² Schaarschmidt and Georgeacopol, *Ber.*, **51**, 1082 (1918).

³ Grieve and Hey, *J. Chem. Soc.*, 108 (1938).

⁴ Cf. Heilbron, Hey and Wilkinson, *J. Chem. Soc.*, 699 (1938).

Action of Ions on Acetylcholinesterase

REFERRING to the publication of D. Nachmansohn¹, we wish to direct attention to the fact that we have previously described² the effect of different divalent ions on the activity of acetylcholinesterase. We think that for some reason this paper did not reach Dr. Nachmansohn.

We have shown that manganese, magnesium and calcium ions are especially active; strontium and barium ions are active to a less degree. Inhibition experiments with sodium fluoride, sodium oxalate and others and the optimal concentration of Ca^{++} ($M/500$) for reactivation after dialysis, revealed the outstanding position of calcium as an activator of acetylcholinesterase in horse serum. We agree with the fact that the electric organ of Torpedo is a far better enzyme material; but horse serum allowed us to demonstrate essentially the same facts as those observed by Nachmansohn, concerning the effect of divalent ions on the activity of acetylcholinesterase.

L. MASSART.

R. DUFAIT.

Laboratory of Veterinary Physiology,
University of Ghent.

April 19.

¹ Nachmansohn, D., *NATURE*, **145**, 513 (1940).

² Massart, L., and Dufait, R., *Enzymologia*, **6**, 282 (1939).

(BY CABLE.)

D. NACHMANSOHN claims¹ that his findings concerning the activation of cholinesterase by electrolytes are "in contrast" to our results reported some time ago². This statement is misleading, as his results were obtained under different conditions and therefore cannot be compared with ours.

The enzyme preparation from the electric organ of Torpedo used in Nachmansohn's experiments appears to have properties unlike those of our preparation obtained from horse serum. While both preparations will hydrolyse the same substrate, there are indications that we are dealing with different enzyme complexes. For example, the activity of the serum preparation is only slightly diminished by dialysis while Nachmansohn's preparation is almost completely inactivated; further, the serum enzyme, in contrast to Nachmansohn's preparation, may be treated with ammonium sulphate as well as evaporated to dryness without any loss of activity.