II. *Acid Solutions.*

$$H_2PO_2^- + M = H_2PO_2 + M^- \qquad (5)$$

$$H_2PO_2 + H_2O = H_2PO_2 + OH. \qquad (6)$$

The reactions of the nickel ion remain as given above. The overall reaction is:

$$H_2PO_2^- + Ni^{++} + H_2O = H_2PO_3^- + Ni + 2H^+.$$

This mechanism differs from that in alkaline solution in the nature of the anion primarily involved in the electron transfer step at the metal surface—reaction (5). The unusual features of the deposition reaction in acid media accounted for include: (i) The independence of rate on both nickel and hypophosphite concentration, since both ions take part in electron transfer steps at the metal surface. The hypophosphite radical first formed afterwards reacts with water to give the OH radical and hypophosphorous acid, which, as they are formed in juxtaposition, will rapidly interact to give the final products of oxidation. This reaction has a free energy change of − 130 k.cal.[2]. (ii) The increase in deposition-rate with agitation of the metal surface is due to impoverishment at the surface of the ion $H_2PO_2^-$.

A curious feature of unexplained origin is that, in mixed nickel–cobalt solutions, only the former is deposited, providing the process is worked under acid conditions.

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Deamination of Amino-Acids by X-Rays

Recently we have isolated products of hydroxylation from dilute aqueous solutions of benzene and benzoic acid irradiated with ionizing radiations (X-rays, γ-rays, neutrons)[1]. The formation of phenolic compounds in these experiments furnished experimental evidence in support of the theory put forward by one of us[2] in 1944, according to which the primary action of ionizing radiations results in the splitting of the water molecules according to

$$H_2O \rightarrow \,.\,.\,.\,.\, \rightarrow OH + H,$$

presumably through the ions H_2O^+ and H_2O^-. These reaction products are similar to those obtained from the same substances by the action of OH-radicals produced chemically (for example, by the hydrogen peroxide – ferrous salt system), or in the biological oxidation of these substances[3]. We have now found that irradiation by X-rays of dilute aqueous solutions of certain simple amino-acids results in an (oxidative) deamination yielding ammonia, and the corresponding aldehydes similar to those obtained from the same substances *in vitro* by the action of OH-radicals produced chemically[4].

The experimental conditions were similar to those reported previously[1]. For example, aqueous solutions of serine (100 ml. solution containing 400 mgm.) were irradiated with doses of the order of 10^6 r. units. The ammonia formed in the irradiated solution was determined by the method of Parnas[5]; the yield being of the order of 0·3 millimoles. (The yields reported in our previous communication also refer to 100 ml. of solution.) The glycolaldehyde was isolated as the dinitrophenylhydrazine derivative (m.p. 156°)[6]. The presence of hydroxypyruvic acid was indicated by positive colour reactions[7].

Corresponding products were isolated in varying yields from irradiated solutions of other simple amino-acids. Full details will be published elsewhere.

The irradiations were carried out at the X-Ray Department of the Royal Victoria Infirmary, Newcastle-upon-Tyne. We are greatly indebted to Dr. F. T. Farmer, who has made all the quantitative determinations of X-ray dosage.

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Influence of Low Temperatures on the Mechanism of the Austenite – Martensite Transformation

Systematic investigations have been carried out on the influence of low temperatures on the lattice parameter of austenite and martensite and on the axial ratio c/a in martensite.

Two plain carbon steels were chosen containing 0·89 per cent and 1·2 per cent of carbon respectively. In order to obtain a martensite structure, the samples were quenched from 930° in brine solution after holding for 15 min. at this temperature in a carbon monoxide atmosphere. Rods of 0·5 mm. diameter were cut from the quenched specimens by cutting very slowly with a carborundum wheel, applying efficient water-cooling. The rods were afterwards etched in order to remove the surface layer.

X-ray photographs of the rods from these steels were taken in 9-cm. and 19-cm. Debye – Scherrer cameras using cobalt radiation and an iron filter. The rods were then immersed in liquid air for one hour and liquid nitrogen for 30 min. and X-ray diffraction photographs again taken. In certain cases, instead of using liquid air or nitrogen, some of the rods were immersed in a liquid helium bath at about 1·5° K. for approximately 6 hr. After liquid air or liquid nitrogen treatment and X-ray examination, some of the rods were treated in liquid helium and examined by X-ray diffraction methods again.

The photographs were photometred by means of the Hilger non-recording X-ray microphotometer. Readings were taken at intervals of 0·1 mm. and sometimes in more interesting cases 0·01 mm. along the entire length of all films, and correction for non-linearity in the blackening intensity curve was made from calibration strips put on the film by means of