Excited States of Stable Nuclei

In Nature of June 8, Powell, May, Chadwick and Pickavance report the use of a camera connected with the cyclotron to study the scattering of high energy particles. Such a camera has been in use by me for more than a year[1]. A picture of the camera was shown in the Royal Photographic Society exhibit last July and a description published[2]. The detection of elastic and inelastic groups for scattered protons has also been reported[3]. For 6·7 Mev. protons the inelastic group in the case of magnesium is relatively slightly larger than shown for neon in the experiments reported by Powell and for aluminium is smaller. In both cases 6·7 Mev. protons have been used. The peak separation for aluminium is about 0·8 Mev. and for magnesium, 1·3. Experiments have also been made with deuterons which will be reported shortly.

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July 19.

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[1] Wilkins, T. R., and Kuerti, G., *Phys. Rev.*, **55**, 1134 (1939); Kuerti, G., and Wilkins, T. R., *Phys. Rev.*, **57**, 1081 (1940).

[2] Wilkins, T. R., *J. App. Phys.*, **11**, 44 (1940).

[3] Wilkins, T. R., and Kuerti, G., *Phys. Rev.*, **57**, 1082 (1940).

The facts quoted by Prof. Wilkins are plain; but these alone, and put in this way, may suggest more than he intends. It has often happened that similar experiments have been carried out at the same time in different laboratories, and I have no doubt it will happen again. The note by Prof. Wilkins and G. Kuerti on the detection of inelastically scattered protons appeared in the *Physical Review* of June 1, and thus before the letter of my colleagues and myself. Prof. Wilkins's experiments and ours have much in common, for they not only deal with the same phenomena but also use the same method for detecting and recording the scattered particles, namely, the photographic plate. The actual arrangements, that is, the 'camera' designs, appear, however, to differ considerably. We were of course unaware of his results at the time of our communication to these columns.

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Velocity of Hydration of Carbon Dioxide in the Presence of Extraneous Substances

The available biological and chemical evidence indicates that the effective germicidal life of aerosols containing sodium hypochlorite depends on the velocity of changes occurring between the collisions of carbon dioxide molecules in the air with droplets of the aerosol, and the appearance of the corresponding hydrogen ions. One of the changes concerned, namely the hydration of the dissolved gas, has been shown by McBain[1] to be a measurably slow reaction, and it is therefore of interest to determine the effect of the salts normally present, and of other substances, upon it.

The differences in the hydration velocity in the presence of salts and certain organic compounds were studied by McBain's method: a slight excess of a saturated aqueous solution of carbon dioxide was added quickly to an alkaline (0·08 M K_2CO_3) solution of the test substance containing phenolphthalein, and the colour change timed against permanent standards. Control runs with alkali and carbon dioxide only were alternated with at least three test runs in each case.

Potassium chloride and bromide, and sodium nitrate and formate had no influence in concentrations up to 1*M*. The absence of a salt effect indicates that the reaction concerned is actually $H_2O + CO_2 \rightarrow H_2CO_3$ rather than ${}^1HO + CO_2 \rightarrow {}^1HCO_3$[2].

Alcohols of very diverse types, and also dioxane, were found to accelerate the reaction. The following is the order of increasing effect; figures in parentheses give the maximum limit of concentration tested: Dioxane (2*M*), methyl alcohol (2*M*), potassium sodium tartrate (that is, ethylene glycol dicarboxylate) (1*M*), β-ethoxy ethyl alcohol (2*M*), glycerol (2*M*).

Glucose (1*M*), and still more sucrose ($\frac{1}{2}M$) retarded the reaction very greatly.

The effect of a retarding or accelerating substance was the same in the presence of inactive salts as in their absence, and there were no differences on substituting sodium for potassium carbonate as the neutralizing alkali.

In the aerosols containing hypochlorites, where high concentrations are immediately reached by evaporation[3], the droplets can be expected to dissolve only small quantities of carbon dioxide as such, so that in this case at least the hydration of the latter may play as important a part as the purely physical factors which have usually been invoked to explain its rates of absorption in various alkaline solutions[4]. Simple hypochlorite aerosols have an extremely short active life, which is, however, increased by the addition of glycerol[5]. This may be due to the toxicity of glycerol itself (or of its oxidation products), but if it depends at all on physico-chemical effects it should be possible to prolong the action still further by using, instead of glycerol, substances which retard the hydration of carbon dioxide as well as its absorption and diffusion.

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[1] McBain, J. W., *J. Chem. Soc.* (Trans.), **101**, 814 (1912).

[2] Thiel, A., and Strohecker, R., *Ber. deutsch. chem. Ges.*, **47**, 1061 (1914).

[3] Finn, S. R., and Powell, E. O., Nature, **144**, 864 (1939).

[4] Killeffer, D. H., *Indus. Eng. Chem.* (Indus. Edn.), **29**, 1293 (1937).

[5] Finn, S. R., and Baker, A. H., Private communication.

Parahydrogen Conversion on Tungsten

This reaction[1] has been reinvestigated using a reaction tube containing a second short filament adjacent to the catalyst filament, so that adsorbed films on the latter might be detected by a measurement of their contact potential[2]. In this way it was shown that the filament in its most catalytically active state was free from adsorbed oxygen. Under these conditions, as J. K. Roberts[3] has pointed out, the clean wire on exposure to gaseous H_2 takes up a *stable* film of hydrogen, which does not evaporate appreciably at room temperature, and so cannot give a *para* H_2 conversion by the mechanism suggested by Farkas[1], namely by $H_2 + 2W \rightleftharpoons 2WH$ (where W indicates a surface atom of tungsten). It is, however, possible[4] that the conversion might