

certain value. If the energy of the neutron is too high the neutron loses in a nuclear encounter a part of its energy, which is emitted in the form of a  $\gamma$  radiation.

From this point of view the increase of the Fermi effect would be due to the production of slow neutrons in a number more than compensating for the loss of primary slow neutrons due to absorption. That the slow neutrons are active in producing the Fermi effect in heavy elements is made plausible by the experiments of Meitner<sup>1</sup>, who used the probably slow neutrons excited in beryllium by the  $\gamma$ -rays of radium.

The block of gold weighing 963 grams was kindly prepared for us by the Polish State Mint and the gold was lent by the Bank of Poland.

Experiments are being continued.

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Dec. 1.

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<sup>1</sup> *Naturwissenschaften*, 22, 759, Nov. 9, 1934.

#### Use of Phosphomolybdic Acid in Chemical Analysis

DURING some recent investigations into the structure of the salts of the 12-heteropoly acids, and, in particular, those of 12-phosphomolybdic acid, it was found that the salts of certain monovalent elements were sparingly soluble. This led us to test whether this fact could be made use of in chemical analysis.

It was found that, using phosphomolybdic acid, a solution containing 1 part of caesium in approximately 500,000 of water could be detected—a far more sensitive test than that of chloro-platinic acid. With potassium, using a concentrated solution of phosphomolybdic acid, a definite precipitate was formed in an acid solution containing 1 part of potassium in 10,000 of water. With such dilute solutions it should be noted that the precipitate takes a few minutes to form. This test is distinctly more sensitive than that of the cobaltinitrite.

Phosphomolybdic acid should be very useful in analytical chemistry, especially in view of the fact that sodium phosphomolybdate and the salts of the di- and trivalent elements are all soluble. The only other insoluble salts of the acid are the ammonium, rubidium, silver, thallos and mercurous salts.

Further tests are now being carried out by one of us (J. W. I.) with a view to the quantitative estimation of potassium with phosphomolybdic acid. The precipitate obtained consists of potassium phosphomolybdate,  $K_3PMo_{12}O_{40} \cdot nH_2O$ . The water content has not yet been definitely ascertained, but we have reason to believe that it is not greater than  $2H_2O$  and probably zero. The structure is closely related to that of  $H_3PW_{12}O_{40} \cdot 5H_2O$  recently determined by Keggin<sup>1</sup>.

The precipitate is very stable, and X-ray powder photographs show that its constitution is unchanged after heating for several hours at 120° C., whereas potassium cobaltinitrite decomposes on heating.

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<sup>1</sup> *Proc. Roy. Soc., A*, 144, 75; 1934.

#### Oxygen Preparation from Sodium Peroxide

THE account in NATURE of November 17, p. 778, by Dr. Newton Friend and Mr. S. Marks of an explosion which occurred during the preparation of oxygen from sodium peroxide and water interested us particularly, since in 1924 we had a similar experience. The oxygen was being prepared by dropping water on to solid sodium peroxide in a flask, without heating, and was being led through drying tubes to an ozoniser. The water contained a little cobalt chloride to catalyse the decomposition of the peroxide.

The reaction proceeded quietly for some time, producing a steady stream of oxygen; then suddenly, without any apparent change in the conditions, an extremely violent explosion occurred in the flask, with results similar to those described by Messrs. Newton Friend and Marks. The conditions differed from theirs in that the explosion occurred spontaneously without the introduction of a glowing splint: the ozoniser was undamaged, and it is therefore not very likely that the explosion was initiated by the discharge. We attributed the explosion to the presence of free sodium in the peroxide, and have since avoided this method of preparation as dangerous.

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#### Chemical Linkage

IN the Research Items in NATURE of October 20, certain arguments are advanced in opposition to the views which we expressed in a recent paper published in the *Journal of the Chemical Society*, and without going into detail we wish to take the opportunity of pointing out that: (1) We cannot call to mind any evidence, chemical or physical, for the alleged non-equivalence of the oxygen atoms of the nitro group; the introduction of the 'resonance' linkage is a hypothesis which, in order to maintain a difference of linkage, renders its experimental detection impossible. (2) The existence of two electrons with parallel spin in the ground level of the oxygen molecule is definitely established by spectroscopic evidence. (3) X-ray spectra reveal the geometrical arrangements of atoms or ions in the crystal lattice and it is true that it is possible to draw definite conclusions with regard to the physical forces present in simple cases. This is, however, by no means possible in complex cases. Thus  $KIO_3$ ,  $CaSnO_3$  and the double salt  $KF, MgF_2$  all possess exactly the same arrangement in the crystal lattice. Similarly, the complex salt  $[Co(NH_3)_6]Cl_2$ , which possesses a characteristic absorption spectrum, has the same lattice as  $[Ni(NH_3)_6]Cl_2$ , which fails to give a Raman line for a nickel- $NH_3$  linkage, and as  $(NH_4)_2SiF_6$ , which sometimes crystallises with one or more additional molecules of ammonium fluoride.

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I AM still not convinced that the equivalence of the two oxygens in the nitro group is "established" by the zero dipole moment of *p*-dinitrobenzene, nor does the existence of two electrons with parallel spin