as ordinarily prepared a nacreous lustre and dissolving readily in water to give a pale yellow solution. Quantitative synthesis gave Rb 76·55, 74·89 per cent; mean 75·72 per cent; calculated for RbCO, 75·35 per cent. The lilac colour attributed to some of these carbonyls only appears when the conversion from ammoniate to carbonyl is incomplete, and is undoubtedly due to a fine dispersion of the former material. When rubidium carbonyl is heated in a vacuum, the usual dissociation sets in about 350°, and proceeds with increasing rapidity as the temperature is further raised, carbonate, carbon and oxide being produced.

Calcium carbonyl is a dirty, cream coloured, pulverulent powder : found Ca 40·75, 43·66 per cent ; mean 42·21 per cent ; calculated for $Ca(CO)_2$, 41·70 per cent. With water, it darkens in colour and partially dissolves with the evolution of heat, but without detonation. When heated in a vacuum it gives carbon, carbonate and oxide, the reaction commencing about 200° and increasing in velocity as the temperature is raised.

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[1] C. R. Acad. Sci., **116**, 1518 ; 1893.
[2] Bull. Soc. Chim., (3), **29**, 585 ; 1903.
[3] Ibid., **35**. 715 ; 1906.

Systems of Four Immiscible Liquid Layers

IN a recent letter Prof. J. R. Partington[1] states that the system of four immiscible liquid layers described by me[2] does not appear to be stable, inasmuch as a specimen, that originally separated into the four layers, now forms two only. A little more than two years ago I prepared a sealed tube containing this system, plus mercury. It has been shaken repeatedly, but still separates into five layers. Moreover, there has been no noticeable tendency for any one of the layers to decrease in volume, much less to disappear. A recent photograph of this tube is reproduced as Fig. 1. A second specimen, made about the same time, behaved in precisely the same way.
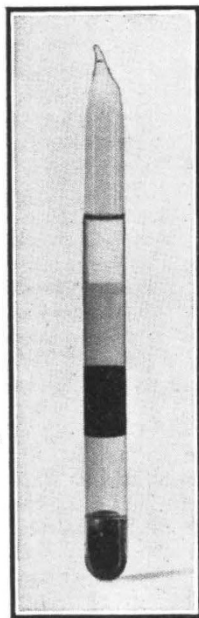
It is difficult to account for the instability of Prof. Partington's specimen, unless indeed impure materials were used (for example, the best oleic acid obtainable commercially is impure) or unless precautions were not taken to exclude atmospheric oxygen and carbon dioxide. The latter will decompose the soap, and the four layers will become three. This might conceivably happen within two years through the action of atmospheric carbon dioxide if the specimens were stoppered with cork or rubber ; but then under such conditions the hexane might evaporate away. The suggestion that some decomposition has occurred, or that impure materials were used, is

FIG. 1.

supported by the fact that the two layers of the unstable specimen are reported to be brown in colour.

The phase rule does not demand that systems shall remain in equilibrium in the presence of reactive substances not included among the components. Indeed, it is applicable even when slow interaction between the components occurs. For example, Schreinemakers' studies of the system succinic nitrile, water,[3] and my own of the system sodium oleate, sodium chloride, water, ethyl acetate,[4] are not invalidated because the nitrile and the ester respectively are slowly hydrolysed by the water. These systems would certainly not remain in equilibrium for two years, but as it happens the system under consideration is not of this type. Provided that it is prepared with pure materials and suitably sealed, it seems likely that it will remain unchanged indefinitely, thus constituting the first example of a system of four immiscible liquid layers in permanent true equilibrium. This claim is sufficiently established by the single example illustrated in the accompanying photograph, and is not weakened by the fact that the same phenomena may not be manifested under slightly different conditions.

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[1] NATURE, **130**, 967, Dec. 24, 1932.
[2] NATURE, **127**, 91, Jan. 17, 1931.
[3] Z. Phys. Chem., **23**, 418 ; 1897.
[4] J. Phys. Chem., **36**, 2455 ; 1932.

Vacant Positions in the Iron Lattice of Pyrrhotite

PREVIOUS investigations on the solubility of sulphur in iron sulphide (FeS) have led to the conclusion that the solid solutions of sulphur in iron sulphide are formed by substituting some of the iron atoms in the original lattice by sulphur atoms. Assuming that the radius of the sulphur atoms is smaller than that of the iron atoms, this hypothesis explains the fact that
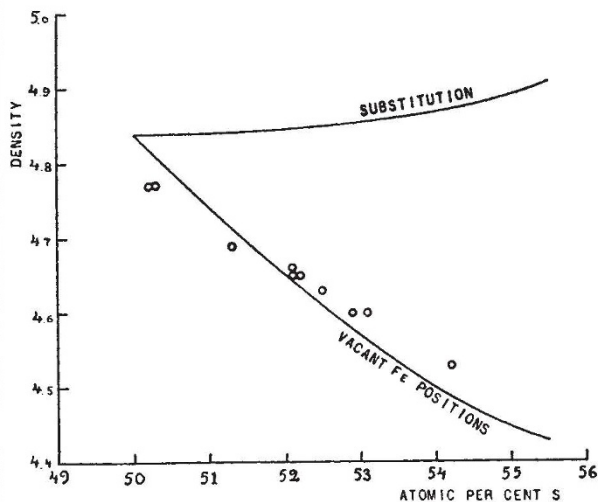

FIG. 1.

the lattice dimensions decrease with increasing sulphur content. It seems, however, doubtful if this relation between the radii of iron and sulphur atoms agrees with reality, and the difficulties are still more increased when one has to explain the analogous (only more pronounced) lattice variations in solid