ethylene and a hydrogen atom. However, this assumption does not appear to be in agreement with results of Bates and Taylor[1b] on the mercury-sensitized reaction in the presence of hydrogen, or the results of von Wartenberg and Schultze with Wood's hydrogen.[8]

[8] Von Wartenberg and Schultze, *Z. physik. Chem.*, **B2**, 1 (1929).

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Blue Colored Water Solutions of the Alkali Metals

BY HENRY J. WOLTHORN AND W. CONARD FERNELIUS

Numerous investigators have observed that the alkali and alkaline-earth metals dissolve in liquid ammonia, the alkyl amines[1] and the fused alkali amides[2] to give solutions of an intense blue color. Kraus has clearly demonstrated that the solutions in ammonia contain the ordinary metal cations and ammoniated electrons. Franklin[3] has long thought that the alkali metals would also give similarly colored solutions in water were it not for the fact that the metals react extremely rapidly with this solvent. A few years ago it was demonstrated that sodium dissolves in molten sodium hydroxide (a derivative of water) to give a blue solution.[2] More recently evidence has been obtained in this Laboratory which indicates that the alkali metals are capable of forming very unstable blue solutions in water. A brief résumé of this evidence follows.

By confining potassium in a short length of 6 mm. glass tubing[4] so that the metal is held at the bottom of a beaker of water and the reaction takes place in a confined space, there appear near the metal at irregular intervals transient blue colored patches of about the same intensity of color as that of the alkali metals in other solvents. When lithium is firmly packed into a piece of glass tubing of small diameter and brought into contact with water, a blue line at the reacting interface is frequently visible. Although sodium similarly confined shows no blue coloration, some such coloration is noticed when bits of the metal adhere to the side of a beaker above the water level so that there is a limited amount of water available for reaction. No blue color is obtained by rubbing sodium or potassium on ice. Calcium shows no colorations during its dissolution in water. Potassium gives infrequent and very small colored regions during its reaction with methyl alcohol but gives none with ethyl alcohol. Lithium and sodium give no such coloration with methyl alcohol.

While these observations are not entirely conclusive it is felt that they do indicate that the alkali metals form unstable blue colored solutions in water. The realization that metals are *physically* soluble in water greatly conditions the point of view which one is to adopt toward such processes as reduction by sodium amalgam and solution of metals in acids.[5]

[1] For bibliography and review see C. A. Kraus, *J. Franklin Inst.*, **212**, 537–62 (1931); W. C. Johnson and W. C. Fernelius, *J. Chem. Ed.*, **6**, 20–35 (1929); W. C. Johnson and A. W. Meyer, *Chem. Reviews*, **8**, 273–301 (1931).

[2] For bibliography see W. C. Fernelius and F. W. Bergstrom, *J. Phys. Chem.*, **35**, 746 fn. (1931).

[3] E. C. Franklin, private communication.

[4] For method of filling these tubes see G. S. Bohart, *J. Phys. Chem.*, **19**, 539 fn. (1915); W. C. Fernelius and I. Schurman, *J. Chem. Ed.*, **6**, 1765-6 (1929).

[5] See for example J. N. Brönsted, THIS JOURNAL, **53**, 3626 fn. (1931).

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A Note on the Stereochemistry of Four Covalent Palladium, Platinum and Nickel Compounds

BY F. P. DWYER AND D. P. MELLOR

The resolution of four covalent palladium,[1] platinum,[2] and nickel[3] compounds into optically active antipodes, and the separation of *cis-trans* isomers of the type [Pt X_2Y_2], where X = NH_3, $(C_2H_5)_2S$, and Y = Cl, Br, . . ., lead to the conclusion that either (a) planar and tetrahedral configurations of the bonds about the central metal atoms are possible in different complexes, or (b) that the disposition of the bonds is in all cases a pyramidal one, a configuration which would account for both types of isomerism. To establish convincing experimental evidence for (b) it must be shown that a given four covalent complex containing two unsymmetrical chelate groups can exist in *cis* and *trans* forms, the latter only of which is resolvable into optical antipodes. While no completely satisfactory evidence along these lines is yet available, the indications are sufficient to warrant further search. For example, Drew and Head[4] have separated *cis-trans* isomers of bisisobutylenediamine platinous chloride; on the other hand, Reihlen and Hühn[2] have obtained incomplete evidence of optical activity in the cation of

[1] Rosenheim and Gerb, *Z. anorg. Chem.*, **210**, 289 (1933).

[2] Reihlen and Hühn, *Ann.*, **489**, 42 (1931).

[3] Reihlen and Hühn, *ibid.*, **499**, 144 (1932).

[4] Drew and Head, *J. Chem. Soc.*, 221 (1934); *Nature*, **132**, 210 (1933).