Phototropy in Inorganic Compounds.

So far no coherent or consistent explanation of the phenomenon of phototropy has been given, although numerous compounds which manifest this property have been studied. A study of the phototropy of dithiotrimercuric salts of the general formula $2\text{HgS} \cdot \text{HgX}_2$ or $2\text{HgS} \cdot \text{HgX}$, according as X is the negative ion of a monobasic or a dibasic acid, has revealed the interesting result that the phototropy in these compounds is due to the decomposition of the compound by the absorption of actinic energy, forming mercuric sulphide and the other mercuric compound, and hence the compounds blacken in sunlight. When preserved in the dark, they again recombine with the emission of radiant energy, giving the original compound.

The ease and facility with which the direct combination takes place in the dark depends in large measure on the fine state of division in which the constituents separate themselves on exposure of the original compound to direct sunlight, and even microscopic examination of the exposed phototropic substance fails to reveal its heterogeneous character. Further confirmation for this explanation has been found in the fact that when the constituents are obtained in a fine state of division either by intimate grinding or by rapid precipitation, and then mixed in proportions determined by the general formula and boiled with water, the compound is formed.

The phototropic substance, as has been stated, represents a molecular mixture of two simpler constituents. If one of the two constituents can be removed by an inert solvent, the residue should no longer manifest the phenomenon of phototropy. This is fully borne out in the case of dithiotrimercuric salts. Thus in the case of dithiotrimercuric halides, the salts are suspended in water and exposed to sunlight with frequent shaking to ensure complete exposure and darkening of the whole salt. The chloride or bromide being soluble can be removed by water and, in the case of the iodide, a dilute solution of potassium iodide is employed. The residue is no longer phototropic and consists of mercuric sulphide.

This mixture theory of phototropy is being examined in the case of other phototropic inorganic compounds which have been recorded.

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Rotation of the Earth and Magnetostriction.

IN NATURE of Jan. 5, 1929, p. 15, there appeared a letter from Prof. Edward S. King on a possible relation between changes in the rate of the earth's rotation and changes in the magnetic declination. Prof. E. W. Brown (*Trans. Ast. Obs.*, Yale University, vol. 3, part 6) is quoted as having shown that changes more or less abrupt occurred in the former quantity about 1785, 1850, 1898, and 1918.

As to magnetic conditions in recent years, it is probable that the observations of Eskdalemuir Observatory, for which hourly values are computed and published, constitute, over the period 1912-27, a homogeneous series from which annual mean values of declination and of at least the horizontal component of magnetic force may be derived with considerable accuracy. It is therefore of great interest to discover that an abrupt change in the rate of decrease

of H occurred about 1918 and an abrupt change in the rate of decrease of D about 1920. From 1912 to 1918 the annual rate of decrease of H averaged and never differed greatly from 22γ ($1\gamma = 10^{-8}$ C.G.S. units); from 1919 to 1927 it averaged 10γ . From 1912 to 1920 the rate of decrease of D averaged and never differed greatly from $9.3'$; from 1921 to 1927 it similarly averaged $12.4'$.

As Prof. King remarks, the whole question is of great interest; like him, I have written this note in the hope that others, acquainted with special aspects of the problem, may pass their judgment.

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Edinburgh, July 10.

Band Spectrum of Magnesium Oxide.

CH. M. OLMSTED noticed that magnesium oxide gives out a band spectrum consisting of several groups of bands (Diss. Bonn; 1906; *Z. f. Wiss. Ph.*, 4, 255; 1906). He classified them into three groups: the first group consisting of bands from $\lambda 4900$ downwards degrading towards violet; the second group was in the region $\lambda 4286$ to $\lambda 4771$; the third group was below $\lambda 3980$, consisting of bands partly degrading towards violet and partly towards red. He classified them in an empirical series.

We have recently studied the band spectrum of magnesium oxide with a Hilger E_1 quartz spectrograph. There are eight distinct groups of bands extending from $\lambda 4372$ to $\lambda 5700$. The 61 band heads have been arranged in the usual n', n'' progression, and the $\Delta n'$ and $\Delta n''$ values of the bands can be well represented by a third degree equation using the least square method developed by Birge and Shea (*Univ. Calif. Pub.*, vol. 2, p. 67, etc.).

The vibrational constants of the molecule have been found to be as follows:

$$\begin{aligned}\omega_0' &= 817.01 \text{ cm.}^{-1} & \omega_0'' &= 773.85 \text{ cm.}^{-1} \\ \omega_0'x' &= 2.378 \text{ cm.}^{-1} & \omega_0''x'' &= 2.86 \text{ cm.}^{-1}\end{aligned}$$

The intensities of the heads have been examined by a Moll microphotometer, and the nature of progression and the intensity relation indicate that the molecule is of the normal type having small change in the moment of inertia. The O-sequence has only four bands the intensities of which rapidly fade away, and both the +1 and the +2 sequences contain a number of bands overlapping to a large extent. A detailed investigation is in progress in this region, and also in the other regions of the spectrum, regarding the character of these bands, and results will be published elsewhere.

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Spectrum of Trebly Ionised Argon.

WITH the aid of the extension of the irregular doublet law described by Drs. Saha and Kiehl, and the method of horizontal comparison, I have been able to effect a classification of the lines of trebly ionised argon from the data given by L. and E. Bloch (*Ann. de Physique*, 1926). All the quartet multiplets due to the transition $2M_2(N_2 \leftarrow N_1)$ have been obtained. $\Delta P_{23} = 645$, $\Delta P_{12} = 590$. $4S_2 - 4P_3 = \nu 42804$, and $4P_3 - 4P_3 = \nu 40560$. $4P_3 - 4D_4 = 36789$.

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