This is equally true for a series of six samples representing different depth of colors, so that the coloring impurities are not concerned. This is shown in Table 2.

The last column contrasts this with a "paraffin ointment 3 : 7" prepared by mixing 30 parts of melted surgical paraffin wax with 70 parts of liquid petrolatum (the Stanolind brands were used). There is considerable deterioration in mixing, but a practical efficiency is maintained for a week.

The physical properties of the paraffin ointment are fairly satisfactory, although it is rather more solid and damp than the commercial petrolatums.

Chlorcosane Solution Overlaid with Petrolatum, Etc.—In order to imitate somewhat the application of a petrolatum dressing over a dichloramin-T dressing, 5 Cc. of chlorcosane containing 2 percent of dichloramin-T were placed in bottles with 20 Gm. of petrolatum, etc., without mixing. After definite periods, these mixtures were thinned with carbon tetrachloride or chloroform, and titrated.

TABLE 3.—TWO PERCENT DICHLORAMIN-T IN CHLORCOSANE, OVERLAID WITH 20 GM. OF PETROLATUM, ETC.: PERCENTAGE OF THE ADDED DICHLORAMIN-T THAT REMAINS UNDECOMPOSED AT THE TIMES STATED.

	Liquid petrolatum.	White petrolatum (2 brands).	Yellow petrolatum.	Paraffin ointment 3:7
At once	100	46–68	98	100
1 hour	95	13–62	42	99
1 day	101	38		
3 days	...	2–7	14	
1 week	87	3	8	60

The results, reproduced in Table 3, again show the inferiority of petrolatum, which may destroy most of the dichloramin-T in an hour. Both the paraffin ointment 3 : 7 and the liquid petrolatum were satisfactory.

CONCLUSIONS.

An ointment of 3 parts of surgical paraffin and 7 parts of liquid petrolatum has relatively little detructive action on dichloramin-T and can be used as a protective dressing on wounds (burns) treated with dichloramin-T-chlorcosane solution, and even as a basis for a dichloramin-T ointment.

Ordinary petrolatum, irrespective of its color, is very destructive of dichloramin-T, and cannot be used effectively in connection with it.

Liquid petrolatum can be used in emergencies as a vehicle for dichloramin-T, although it is inferior to chlorcosane.

Solutions of dichloramin-T in carbon tetrachloride are very stable, while those in kerosene or in olive oil deteriorate very rapidly.

NOTES FROM THE RESEARCH LABORATORY, GENERAL ELECTRIC COMPANY.*

X-RAY CHEMICAL ANALYSIS.

BY A. W. HULL.

The method of X-ray crystal analysis, developed in the Research Laboratory of the General Electric Company just before the war, is being further developed

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as a method of chemical analysis which promises to have a very wide and new field of application in that it gives evidence which other methods do not supply, namely, the form of chemical combination of each of the elements present.

The method consists in reducing the substance to be examined to powder form, placing it in a small glass tube, sending a beam of monochromatic X-rays through it, and photographing the diffraction pattern produced. The only apparatus required is a source of voltage, an X-ray tube, and a photographic plate or film. The amount of material necessary for a determination is one cubic millimeter. The method is applicable to all chemical elements and compounds in so far as they are crystalline in form.

The rays from the X-ray tube pass through a filter, which absorbs all but a single wave length, then through two slits, which confine them to a narrow beam (about 1 mm. wide); then through the powdered material, which scatters or "reflects" a very small fraction of them; and thence to the center of the photographic film. An exposure of from one to twenty hours is required, according to the amount of information desired.

When the film is developed it shows, in addition to the over-exposed line in the center, where the direct beam strikes, a series of other lines on each side of the center. These lines are caused by the "reflections" of the X-rays from the tiny crystals in the powder. Their distance from the center of the film depends on the distance between the planes of atoms in the crystal, and there is one line for every important set of planes in the crystal. It is evident, therefore, that substances with different crystalline structures will give entirely different patterns of lines. Substances of similar chemical nature and therefore similar crystal structure give similar patterns, but the magnification or spread of the pattern is different for each one, being inversely proportional to the cube root of the molecular volume. Since no two similar substances have *exactly* the same molecular volume it is easy to distinguish them, as the difference is cumulative for lines far from the center. A further distinguishing mark is the relative intensity of the different lines which differs greatly even in the most closely related compounds, depending on the relative shapes and sizes of the atoms in the compound.

A knowledge of the theory of the production of these lines, and their relation to the crystalline structure of the substance, is not essential to their use for chemical analysis. All that one needs to use in a chemical analysis is the fact that every crystalline substance gives a pattern; that the same substance always gives the same pattern; that no two different substances give the same pattern; and that in a mixture of substances each produces its pattern independently of the others, so that the photograph obtained with a mixture is the super-imposed sum of the photographs that would be obtained by exposing each of the components separately for the same length of time. This law applies quantitatively to the intensities of the lines, as well as to their positions, so that the method is capable of development as a quantitative analysis.

As illustrations of the general type of photographs obtained with simple compounds and elements, Fig. 1 shows a series of isomorphic alkali halogens, illustrating their similarity of pattern and their differences in spacing and intensity; and Fig. 2 gives a series of dissimilar substances, illustrating their different types of pattern.

Several actual analyses have already been made which will be described in detail elsewhere.[1] It has been found very easy to recognize at a glance each component in a three component mixture and in the case of the simpler salts many more than this could certainly be identified. Accurate quantitative tests have

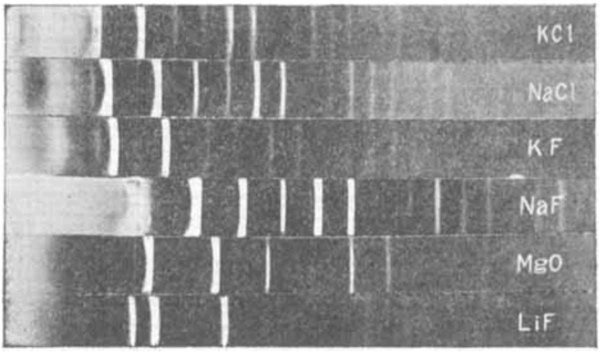

Fig. 1.

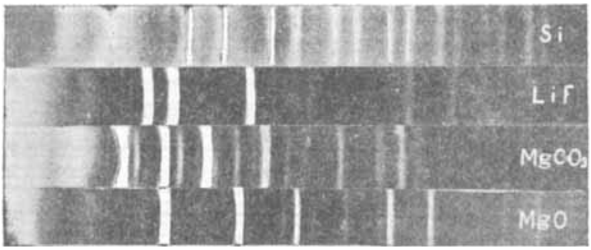

Fig. 2.

not yet been made, but it is anticipated that an accuracy of one percent will be easily obtainable, for components present to the extent of one percent or more of the whole sample.

THE RELATION OF LIGHT TO HEALTH.*

BY CHARLES E. DE M. SAJOUS, M.D., LL.D., SC.D.

The word "ferment" is steadily being replaced in medical phraseology by the word "enzyme." In the words of Professor Mendel, of Yale, "Enzymes are no longer thought of exclusively as agents of the digestive apparatus; they enter everywhere into the manifold activities of cells in almost every feature of metabolism." In other words, the same ferments, pepsin, trypsin and others which first prepare foodstuffs in the stomach and intestine, for assimilation by the tissues of the body at large, are the same agents which carry on certain functions in the intimacy of the tissues.

[1] *J. Am. Chem. Soc.* for June or July.

* Abstract of a paper presented before the Philadelphia Section of the Illuminating Engineering Society, and published in the Transactions of the Society.—Through *Scientific American.*