

translations of amount  $a$  parallel to the cubic axes. Atom-centres therefore lie at the centre of this cube and at the mid-points of its twelve edges.

Contrary to the most recent statement of Messrs. Carpenter and Tamura, reflection in an octahedral—[111]—plane through atom-centres involves in the diamond structure the same abnormally small distance between atom-centres—two-thirds the normal distance—as does reflection in the octahedral plane they first considered.

In this connexion it is interesting to observe that in the diamond-like structure of silicon it is possible to choose a position for an octahedral twinning plane which involves no change in least inter-atomic distance. Such planes cut orthogonally the cube-diagonal in the usually chosen unit of structure at points distant  $a\sqrt{3}/8$ ,  $11a\sqrt{3}/24$ ,  $19a\sqrt{3}/24$  from a corner of the cube. One cube which is bisected by such a twinning plane has atom-centres at the points  $(a/8, a/8, a/8)$ ,  $(a/8, 5a/8, 5a/8)$ ,  $(3a/8, 3a/8, 7a/8)$ ,  $(3a/8, 7a/8, 3a/8)$ ,  $(5a/8, a/8, 5a/8)$ ,  $(5a/8, 5a/8, a/8)$ ,  $(7a/8, 3a/8, 3a/8)$ ,  $(7a/8, 7a/8, 7a/8)$ .

In this case the twinning plane passes through no atom-centres.

No general rule can be stated as to whether the twinning plane for least lattice distortion contains atom-centres or not, since, as seen above, this depends upon the lattice.

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#### The Origin of Humic Matter.

THE origin of the humic matter of coal, peat, and the soil has been the subject of controversy for many years. At present an increasing amount of support is being given to the hypothesis of Fischer and Schrader, who regard lignins as the parent substances of humic matter. The older view, according to which carbohydrates (notably cellulose) are primarily concerned in the production of humic matter, finds less support than formerly. Waksman has suggested that the humic matter of soils is a mixture of unchanged lignins with the organic substances derived from the life processes of micro-organisms.

For some time past this question has been under investigation in the chemical department of this Station. On the whole, the results so far obtained are in favour of the origin of humic matter from lignins. There is a marked resemblance between the general properties of lignins and humic acids. We are now studying the action of aqueous sulphur dioxide under pressure on a variety of humic acids prepared from natural sources and artificially. We have found that this treatment effects a true fractionation of humic and hylatomelanolic acids of natural origin, and that the substances brought into solution show close analogies with the lignosulphonic acids obtained in the bisulphite treatment of wood pulp. Salts of organic bases with the 'sulphonic acids' from one variety of humic acid have been made, and found to show distinct double refraction, indicating a tendency towards crystallisation. The proportion of insoluble residue from sulphur dioxide treatment varies markedly with different preparations of humic acid, and its nitrogen content is not appreciably different from that of the original material.

These results suggest strongly that there is a close relationship between natural humic acids and lignins. It is, however, not yet possible to say whether this is due merely to the presence of unchanged lignins in natural humic acid preparations, or whether humic acids themselves are actually chemically related to lignins. Further work is in progress with the aim

of deciding this question, together with the closely related question of the state of the nitrogen in natural humic acids.

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#### Intensity Distribution in the Fine Structure of the Balmer Lines.

IN the course of an investigation of the fine structure of the Balmer lines, at present being undertaken in this Laboratory, certain preliminary results of an apparently novel character have been obtained which seem to be of considerable interest. These refer to the dependence of the relative intensities of the two components  $\lambda'$  and  $\lambda''$  of  $H_\alpha[\lambda' < \lambda'']$ , referred to in a recent letter in NATURE (Jan. 29, p. 163), upon the conditions of the discharge and in particular upon the diameter of the tube in which the discharge takes place.

Three discharge tubes were used. In the first the average diameter of the capillary was 0.16 cm. The intensity ratio of  $\lambda''$  to  $\lambda'$ , about 3:1 in this tube, was not appreciably dependent on either pressure or current density. The average diameter of the second tube was 0.6 cm. In this case the intensity ratio, now approximately unity, was, in agreement with Hansen's results (*Ann. d. Phys.*, 78, p. 558; 1925-26), primarily dependent upon the gas pressure and to a less degree upon the current density.

In an attempt to elucidate the striking difference between the results obtained in the above cases, an apparatus consisting of a tube of average diameter 0.6 cm. fixed axially with a second of about 0.9 cm. diameter was constructed. The apparatus was arranged so that independent discharges could be sent through the axial tube and through the space between it and the outer one (about 1 mm.), the pressure being the same in both. In the former, the intensity ratio was again dependent upon the gas pressure and current density, as it was in the second tube; in the latter, the intensity ratio was practically constant, and of the same magnitude as it was in the first tube.

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#### Electro-deposition of Rubber.

IN the description of the process of electro-deposition of rubber given in NATURE of Jan. 22, pp. 129 and 130, there occurs one statement which might be misleading to those not actually acquainted with the process. After reference to certain operating conditions it is said, "Against these advantages must be set the fact that, since rubber is a non-conductor, it is possible to obtain only comparatively thin sheets of rubber product, though further investigation will doubtless remove this limitation."

Although, of course, rubber is a non-conductor, the deposit of latex rubber particles, with or without other filling material, forms a spongy gel which is still permeated by the intermicellar liquid, which, of course, is an electrolytic conductor. Consequently the electro-deposited rubber is not actually an insulator, but is perfectly analogous to a porous diaphragm electrolytically connected with a metallic anode. Such limitations as exist in regard to the thickness of coating depend mainly on other conditions, therefore, than the formation of an insulating layer.

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