



Fig. 3. Schematic representation of the mode of adsorption on galena face of xanthate (a), and dithiophosphate (b). Adsorbates are represented by squares

The interpretation of the present streak pattern may be that diethyl dithiophosphate, whether as acid molecule or as anion, has been adsorbed on the galena lattice with a mode drawn schematically in Fig. 3b. In this adsorption, lead atoms at the sites of the next nearest neighbours of any occupied lead atom on the galena face are occupied by the adsorbates. As compared with the case of xanthate (Fig. 3a) the area occupied by an adsorbate is twice as large in the present case. This may be attributable to the supposed difference in the areas of the cross-sections of dithiophosphate and xanthate, the former being twice as large as the latter.

That the present streaks were not due to surface anomalies of the cleavage face itself was shown by examining a number of randomly selected cleavage samples from the same crystal block from which specimens for the study of adsorption were obtained. In no instance was a diffraction pattern like that represented in Fig. 2 obtained from any portion of the cleavage faces. By the mere soaking of the cleavage face in distilled water containing no dithiophosphate but under otherwise the same experimental conditions, the present streak pattern was not obtained at all. Further details of this work, including interactions with oxidized surfaces, will be published elsewhere.

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¹ Hagihara, H., *J. Phys. Chem.*, **56**, 616 (1952).

² Wyckoff, R. W. G., "Crystal Structures", 1 (Interscience Publishers, Inc., New York, 1948).

³ Hagihara, H. (to be published shortly).

⁴ Müller, A., *Proc. Roy. Soc., A*, **120**, 437 (1928).

Occurrence of μ -CaCO₃ in Boiler Scale

DURING small-scale experiments at the Fuel Research Station on the effect of treatment of boiler feed-water on the structure of boiler scales, several deposits were examined by X-ray diffraction. Most of the deposits contained calcium carbonate as calcite and calcium sulphate as anhydrite. In the deposit from one of the experimental boilers, the bulk of the carbonate, however, occurred as the rather unusual hexagonal form, μ -CaCO₃ or vaterite. This overlay a thin band of calcite. It is believed that this is the first occasion on which μ -CaCO₃ has been reported in such deposits.

There were no notable differences between the conditions of operation of the boilers producing a

deposit of a normal type and those producing the deposit containing μ -CaCO₃. Periodic analyses of the feed-waters to the boilers showed no appreciable differences in the quantities of calcium, magnesium, sulphate, silicate, total dissolved solids, total hardness, or hydrogen ion concentration. It has not been found possible to explain the presence of this unusual type of carbonate deposit as due to variations in the main characteristics of the feed water, or in the conditions of operation of the boilers.

The occurrence of μ -CaCO₃, which is reported to be more soluble than calcite, agrees, however, with the decrease that was recorded in the total weight of the deposit in the boiler, and the accompanying increase in the dissolved solids in the water removed from the boiler. It would follow that while the μ -CaCO₃ was being deposited, the boiler water must have been supersaturated with respect to calcite. It is possible that this was caused by the fortuitous appearance in the feed-water of a substance or substances that repress the crystallization of the less-soluble forms of the carbonate. Samples of the feed-water to the various boilers were not examined for their minor constituents; but a comparative spectrographic analysis of the carbonate deposits gave results that were of interest. The most notable differences were that the deposits containing μ -CaCO₃ held larger quantities of lead, and smaller quantities of strontium, magnesium and silicon, than those which contained mainly calcite. There was no apparent difference in the phosphorus content of the two types of deposit.

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Influence of 'Surface Chilling' on the Detonative Behaviour of Cast Trinitrotoluene

IN an earlier communication¹, attention was directed to the influence of charge-cooling conditions on the detonation velocity of cast T.N.T. Since this effect is of considerable interest by virtue of its bearing on the various theories put forward to account for the initiation of the explosive decomposition at the shock wave front, and because of its importance in connexion with the study of marginal confinement effects in cast explosives, the following examples of its operation are presented.

Charge casings of lead, copper and steel were employed. The degree of 'surface chilling' was varied by heating the charge-casing prior to pouring in the molten T.N.T., and in one case further variation was obtained by slower cooling of the charge after casting. Special casting techniques were employed in order to avoid cavitation of the cast charges. The velocities of detonation obtained using the Dautriche method² are recorded in Table 1. The degree of confinement *S* expresses the number of grams of metal per sq. cm. of charge surface.