gratings⁶. We hope to publish elsewhere a more detailed account of the images of crystal lattices formed in electron microscopes.

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¹ Hashimoto, H., and Watanabe, H., *Nature*, **188**, 571 (1960).

² Cowley, J. M., and Moodie, A. F., *Proc. Phys. Soc.*, B, **70**, 486 (1957).

³ Cowley, J. M., and Moodie, A. F., *Proc. Phys. Soc.*, B, **70**, 497 (1957).

⁴ Cowley, J. M., and Moodie, A. F., *Proc. Phys. Soc.*, **71**, 533 (1958).

⁵ Cowley, J. M., and Moodie, A. F., *Acta Cryst.*, **12**, 360 (1959).

⁶ Cowley, J. M., and Moodie, A. F., *Proc. Phys. Soc.*, **78**, 378 (1960).

CHEMICAL ENGINEERING

A Rapid Method for the Determination of Tetramethyl Lead and Tetraethyl Lead in Petrol

THE use of tetramethyl lead as anti-knock additive in petrol sets a new problem to the petroleum laboratories in connexion with the determination of these additives. The standard A.S.T.M. method D 526-56 cannot be used for the analysis of petrols containing a mixture of tetramethyl lead and tetraethyl lead or for the determination of lead in a sample containing alkylated lead additives.

We have tried to work out a rapid method for the qualitative determination of tetramethyl and tetraethyl lead in petrols. First, we tried to use a colour reaction with dithizone reagent. Dithizone in chloroform solution is added to the petrol. The mixture is shaken with water and a red colour appears in the organic phase. The reaction mechanism is apparently different for the tetramethyl and the tetraethyl lead. Tetraethyl lead seems to be less stable than tetramethyl lead; it hydrolyses more quickly and a red colour appears, whereas tetramethyl lead does not undergo any reaction. This test being extremely sensitive (limit 0.04%), errors due to impurities in glass or water are likely to occur. It is also unsuitable for use with a red-coloured petrol.

We therefore tried another method, using petrol fractions obtained by distillation. Afterwards, we examined the different fractions by means of a Zeiss flame spectrophotometer M4Q at 406 mμ in order to determine the lead.

Generally, we have taken four fractions and the residue: initial boiling point to 100° C.; 100° to

125° C. (fraction containing the tetramethyl lead); 125° to 150° C.; 150° to 175° C.; and the residue (containing the tetraethyl lead). About 250 c.c. of petrol are distilled on a 'Vigreux' column (30 cm. in length), in 2 hr. We observed that the slower the distillation, the better the separation of the lead in the spectrophotometric determination.

To check the method, we used a platformate containing tetramethyl lead, a platformate containing tetraethyl lead and a platformate containing tetramethyl and tetraethyl lead. The figures in Table 1 indicate the galvanometer readings expressing the light intensity of the flame. The apparatus was standardized at a reading of 50 with a platformate containing 4.2 c.c. tetramethyl lead per Imperial gall. An oxy-acetylene flame is used. Only the figures in the horizontal lines of the table should be compared with each other. In this determination we did not consider the flame background of the different fractions. Since these results on lead distribution in known mixtures were reasonable, we examined commercial samples. The results are summarized in Table 2.

The petrols showing high readings in the 100° to 125° C. fraction were those giving aberrant results in the A.S.T.M. determination D 526-56. Moreover, these results tally with those advertised by petroleum companies. The method given here is simple and allows one to estimate tetramethyl and tetraethyl lead. Anti-knock quantitative analysis may be carried out in the usual way.

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CHEMISTRY

Influence of Chemical Isomerism on the Szilard-Chalmers Processes in Solids

THE recent appearance¹ of a communication concerning the Szilard-Chalmers effect in *cis*- and *trans*-dichloro-*bis* (ethylenediamine) cobalt (III) nitrate prompts us to report the following results.

A considerable amount of work has been published in which processes associated to the Szilard-Chalmers effect are studied in solid-state complex combinations.

Table 1

Fractions	Initial boiling point to 100° C.	100° to 125° C.	125° to 150° C.	150° to 175° C.	Residue
Platformate + tetramethyl lead	5	58.5	26	10	3
Platformate + tetraethyl lead	5	9.5	10	14	28
Platformate + tetramethyl lead + tetraethyl lead	18	33	19	21	37

Table 2

Fractions	Initial boiling point to 100° C.	100°-125° C. (tetramethyl lead)	125°-150° C.	150°-175° C.	Residue (tetraethyl lead)
Sample A, 'super'	4	47	30	20	7
Sample B, 'super'	7	41	37	25	14
Sample C, 'super'	9	44	36	19	17
Sample D, 'super'	8	38	25	—	8
Sample E, 'normal'	3	11	22	—	60
Sample F, 'super'	5	13	17	27	56
Sample G, 'normal'	4	6	8	14	69
Sample H, 'super'	3	12	24	24	50