laboratory. Since the crystal lacks a centre of symmetry, is piezoelectric and has a good (001) cleavage perpendicular to the polar axis, it is likely that thin plates could be prepared for the examination of possible ferroelectric effects.

We do not plan further work on this compound.

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Absolute Measurement of the Intensity of the (111) Reflexion for Diamond

ATOMIC scattering factors of carbon atoms in the valence state, as computed by McWeeney[1], are in close agreement with the values obtained on the basis of measurements on diamond[2]. An exception occurs only in the f_c-value of (111), which was found to be 3·299, while McWeeney's theoretical value is close to 3·100.

To clear up this discrepancy, a careful re-determination of the absolute intensity of the (111) reflexion of diamond has been made. To avoid extinction effects, the measurements were carried out on a fine and pure diamond powder of particle size about 0·5μ. Particles of this size might still show some extinction. However, this influence on the intensity should be small and not exceed 1 per cent. The discrepancy is much larger.

The intensity was measured by two different techniques, surface reflexion and transmission. A Geiger proportional counter was used ('Norelco') and crystal monochromatized radiation. To avoid λ/2 in the monochromatized beam, voltages not higher than 14 kV. were applied to generate the copper K-radiation.

Table 1 contains the results.

Table 1

Method	Operation of X-ray tube kV.	m.amp.	1/8 F_{111}
Reflexion	14	20	2·211
,,	10	20	2·212
,,	14	20	2·222
,,	12	20	2·037
,,	14	18	2·166
,,	14	18	2·168
,,	14	18	2·104
Transmission	14	18	2·295
,,	14	18	2·206
,,	14	18	2·256

The mean value of these measurements was taken in two different ways, with and without weighting the accuracy of the single measurements. The weighted mean is 1/8 $F_{111} = 2 \cdot 20 \pm 0 \cdot 07$, $f_c = 3 \cdot 11 \pm 0 \cdot 10$, whereas the unweighted mean is 1/8 $F_{111} = 2 \cdot 18_8 \pm 0 \cdot 07$, $f_c = 3 \cdot 09 \pm 0 \cdot 10$. Both these values agree with the figure calculated by McWeeney within the limit of error.

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METALLURGY

Structure of Scale on Plain Carbon Steels

THE classical picture of high-temperature scales on plain carbon steels as determined by Pfeil[1] shows a three-layered structure. An outer layer of hæmatite, Fe_2O_3, a middle one of magnetite, Fe_3O_4, and an inner one of wüstite, FeO, next to the parent metal is the normal composition of this layered structure in a scale that is continuous with the parent metal. (For practical and historical reasons, wüstite is normally given as the stoichiometric FeO when in fact it is more accurately described as $Fe_{1-Y}O$, where Y is the concentration of vacancies.) Similarly, Paidassi[2], in his recent work on the kinetics of oxidation of pure irons between 700° and 1,250° C., found that the three-layered structure is present on continuous scales. However, 15 min. was the minimim oxidizing time for the lower-temperature scales that he reported.

It is known that the simple layered structures of plain carbon steel scales are modified in practice by the production of pores and blisters. After a short initial period of oxidation, these defects occur rather readily. Furthermore, in the laboratory the production of continuous scales by extensive oxidation requires elaborate surface preparation including high-temperature anneals in hydrogen to produce a clean surface prior to the oxidation experiment.

It has been assumed generally that the structure of the thin scales on the products of the modern continuous rod and strip mills conformed to the classical picture of scale structure. However, during the microscopic examination of the scales of these products, unusual types of structure were observed. Fig. 1 illustrates one type of structure first noticed on samples of wire rod. It was considered rather unusual at the time. However, in the examination of narrow hot strip samples extensive regions of this type of structure were observed (Fig. 2). It has been given the description of a 'sandwich' structure. There is almost no evidence of blistering and it is essentially a continuous scale with the parent metal.

The innermost layer in contact with the parent metal is magnetite. The middle layer is wüstite and the next layer is again magnetite. In some instances a thin outer layer of hæmatite is also observed. This unusual innermost layer of magnetite is similar in appearance to the outer primary magnetite layer when examined under the optical microscope. Its micro-hardness is also of the same order as the primary magnetite layer. When etched it appears as a single phase with sharp boundaries, and in no way resembles the dark-etching decomposed wüstite