detailed discussion of our experiments and their implications will be published elsewhere.

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Strengths of Metals

No experimental method has been suggested for recording directly the pure diffraction broadenings of X-ray reflexions; there is always an appreciable amount of broadening due to experimental conditions, and the diffraction broadening has to be disentangled from the total broadening by various procedures^{1,2}. In any statement of results, therefore, it is essential that the particular procedure used should be stated, so that even if other workers think it unsatisfactory they should at least have some basis for comparison with their own results.

Wood and Rachinger do not give such experimental details in the results they have recently published³. In re-stating the claim that the broadening of X-ray reflexions from cold-worked metals is due to the smallness of the crystallites into which the grains are broken, they make no reference to our critical comments⁴ on evidence previously given⁵ in support of this claim, nor to the considerable amount of experimental work⁶⁻⁹ which points to inhomogeneous internal strains as the principal cause of the broadening.

There still remains, however, the striking agreement obtained for the yield stresses of a number of metals when the values of Wood's 'limiting crystallite size' are substituted in the expression that Bragg¹⁰ has derived theoretically. The main purpose of this present communication is to show that this agreement results also from the theory that the broadening of the reflexions is due to inhomogeneous internal stresses, the argument being as follows.

Wood's 'limiting crystallite size' t may be regarded as a parameter related to the broadening β by the relation

$$t = \lambda/\beta \cos \theta, \quad (1)$$

where λ is the wave-length of the radiation, and θ is the Bragg angle. (In effect, this is Wood's original definition, but the unfortunate name he proposed for the parameter has been the cause of much misconception.) In Bragg's theory of the strength of metals¹⁰, it is shown that the yield stress Y should be related to the true crystallite size t_c by the expression

$$Y = ns/t_c, \quad (2)$$

where n is the rigidity and s is the atomic diameter. If Wood's values for t are substituted for t_c , Bragg showed that the correct order of magnitude for Y is given for a number of metals.

Combining equations (1) and (2), we have

$$Y = ns\beta \cos \theta/\lambda. \quad (3)$$

Now, according to Stokes, Pascoe and Lipson⁷, the yield stress should be related to β by the expression

$$Y = E\beta \cot \theta, \quad (4)$$

where E is Young's modulus, which for the present purpose may be regarded as constant.

Equations (3) and (4) may be written as

$$\left. \begin{aligned} Y &= \frac{ns}{\lambda} \beta \cos \theta \\ \text{and } Y &= \frac{E}{\sin \theta} \beta \cos \theta \end{aligned} \right\} \quad (5)$$

and it can be shown that ns/λ and $E/\sin \theta$ are approximately equal for the conditions of Wood's experiments.

The ratio of these quantities is

$$\frac{ns \sin \theta}{E \lambda} = \frac{1}{2(1+\sigma)} \frac{s}{\lambda} \sin \theta, \quad (6)$$

where σ is Poisson's ratio. $\sin \theta$ is almost exactly unity, because Wood uses only the back reflexions, and, since $\sigma \simeq 0.3$,

$$\frac{ns \sin \theta}{E \lambda} \simeq 0.4 \frac{s}{\lambda}. \quad (7)$$

For most of the metals considered, $s \simeq 2.5 \text{ \AA.}$, but λ , of course, is different for different radiations. We may, however, take the two radiations quoted by Wood³ as examples; for cobalt $K\alpha$, $0.4s/\lambda \simeq 0.55$, and for molybdenum $K\alpha$, $0.4s/\lambda \simeq 1.4$. Thus the coefficients of equations (5) are approximately equal, and approximately correct values of Y follow from either of them.

In order to distinguish between the two equations, qualitative work is useless; quantitative results, for the variation of β with both θ and λ , are necessary, and we believe that these results have already been produced in the papers quoted in this communication.

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Absorption of 12.5-mm. Wave-length Electromagnetic Radiation in Supercooled Water

We have recently succeeded in measuring the absorption of radio waves of wave-length 12.5 mm. in transmission through water in the supercooled state in layers of varying thickness up to several millimetres: the lowest water temperature so far reached in this work is -7°C.

The complex refractive index of an absorbing medium may be expressed as $(n - j\kappa)$, and our measurements have led to a determination of the absorption coefficient κ . It is well known that if such an absorbing medium is inserted in a wave-