of the beta-phase during quenching. The cellular structure bears some resemblance to that observed under the optical microscope in copper–aluminium alloys which have been isothermally treated to produce a mixture of the disordered beta-phase and the ordered beta$_1$-phase (ref. 4 and Thomas, D. L., unpublished work). It is of interest to note that the diffraction pattern of the quenched copper–indium beta-phase has been found to contain lines which indicate a superlattice structure[1]. Thus, it seems possible that the cellular structure may be associated with the occurrence of an ordering reaction on quenching.

Optical microscopy showed that in some regions of the quenched beta-phase, immediately adjacent to the edge of the pearlite nodules, the structure was somewhat columnar in appearance. This effect occurred rather irregularly: where such columnar zones were observed they were commonly approximately 2μ in extent. A similar structural feature was reported by Spencer and Mack[3]. Examination of replicas confirmed that the cellular structure in these zones tended to adopt a columnar form. (This effect is not seen clearly in the particular micrograph shown.) The columnar zones may be associated with the presence of a strain gradient in the beta-phase adjacent to the pearlite nodule interface, the strain being due to volume changes accompanying pearlite formation. During quenching from the transformation temperature, the strain gradient might influence the morphology of the decomposition product of the beta-phase. In the examination of the replicas no interface was detected between the matrix of the cellular structure and one of the phases of the pearlite.

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Embrittlement of Tungsten and of Molybdenum

A RECENT paper from this laboratory[1] described the embrittlement of tungsten wire if it be heated in atmospheres containing even traces of ammonia. This work has been extended and has revealed a fact, unobserved in the original study, which furnishes further information which may be helpful in understanding the mechanism. In earlier experiments, the procedure was to heat a length of wire, leaving untreated ends which, since they had not been embrittled, could be clamped in the tensile testing machine without fear of fracture there. The disadvantage of this procedure is that the specimen under test had regions which reached lower temperatures

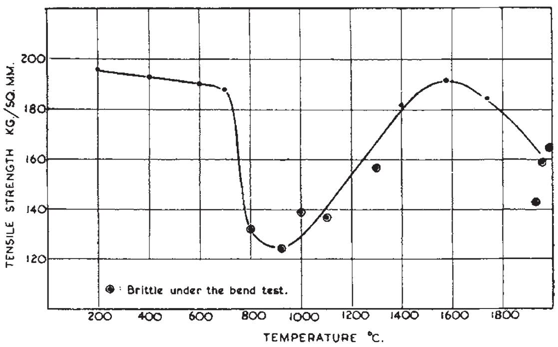

Fig. 1. Effect of heating for 10 min. in 0·2 per cent ammonia on the tensile strength at 20° C. of 180-μ tungsten wire

than the central portion, so that any minimum in the embrittlement/treating-temperature curve would not be shown. This aspect was studied in the present series of tests. In these, wire was first annealed so that primary recrystallization was complete[2], and then reheated in nitrogen/hydrogen mixture containing 0·2 per cent ammonia. The whole specimens were then used for the test, neglecting those which broke in the clamps.

The results are given graphically in Fig. 1 and show that a minimum embrittlement does indeed occur after heating near 1,600° C.; above this, there is again further embrittlement. Both strength and bend tests were made; the latter were the more subjective but gave clear indications of qualitative changes: specimens which were brittle under this test are also indicated in Fig. 1.

Some recent work which we hope to publish soon has shown that embrittlement of molybdenum wires occurs on heating in presence of elementary nitrogen. While this effect can be important practically, it is quantitatively rather too small to reveal clearly any minimum in the mechanical properties. However, measurements of gas content of treated wires demonstrated that the absorption of nitrogen certainly shows a minimum near 1,300° C., which was not observed in the temperature-range studied by Tury[3], and it may be that there is a parallel mechanism operating for these two similar metals.

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CHEMISTRY

Benedict's Solution as a Developer in Carbohydrate Chromatography

WHILE a large number of reagents have been developed for the differentiation of carbohydrates by chromatography, there is still some difficulty in showing reducing sugars in many biological materials. Many of the developers, such as silver nitrate, tend to become easily reduced and to stain the whole