In view of the strong affinity of chromium for nitrogen (binding energy at 20° C. approximately 1 eV.)[8], the precipitated chromium nitrides would be expected to be stable, and would be unaffected by the 'dissolving' effect of adjacent unsaturated dislocations (the binding energy of which for nitrogen would be expected to be similar to that in iron, about 0·45 eV.)[9]. Precipitation at an intermediate temperature (such as 400° C.) would therefore be expected permanently to remove nitrogen from solution and reduce the amount remaining to cause brittleness at lower temperatures.

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Effect of Stress on Hole Formation during the Diffusion of Zinc from Brass *in vacuo*

It has been suggested by Greenwood[1] that intergranular fracture during deformation at elevated temperatures, which occurs by the linking together of isolated holes at grain boundaries, is the result of precipitation of excess vacancies produced by the deformation. Some doubts have been cast on this view. For example, in diffusion couples, holes may be formed by the precipitation of excess vacancies produced by the unequal rates of diffusion of the components, but these holes have little preference for grain boundaries. An exception to this can occur, however, during the diffusion of zinc from brass *in vacuo*, and Balluffi and Seigle[2] have suggested, without proof, that in this case the preferential formation of holes at grain boundaries is associated with the presence of stress.

In the course of an investigation of the effect of applied stresses on brass foils, 0·001 in. thick, during the removal of zinc by diffusion *in vacuo* it has been found that the presence of stress markedly affects the distribution of holes. Fig. 1,*a* shows randomly distributed holes in a brass foil containing 0·2 per cent antimony which was tested free of stress *in vacuo* for 1 hr. at 800° C. to remove nearly all the zinc. I have shown previously[3] that the presence of 0·2 per cent antimony enhances the formation of holes during the removal of zinc. The same material fractured after 5 min. under a nominal stress of 170 gm./mm.², and Fig. 1,*b* shows that at this time the holes had formed preferentially at grain boundaries. To show that these cracks at grain boundaries were not due to the applied stress in the absence of an excess of vacancies produced by diffusion, a specimen was

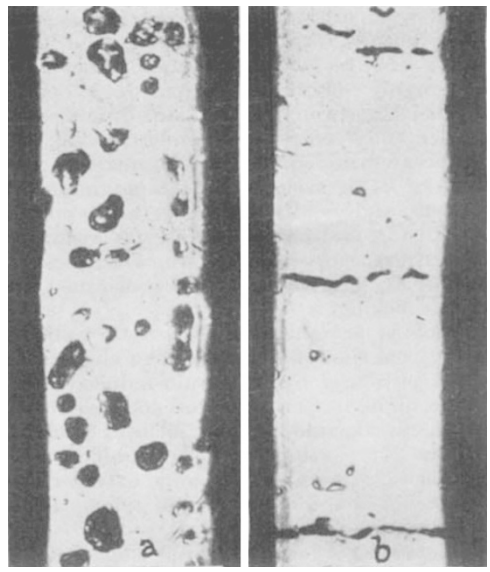

Fig. 1. Brass containing 0·2 per cent antimony. (*a*) Tested free of stress. Random distribution of holes. (*b*) Broke after 5 min. under stress. Preferential formation of holes at grain boundaries. × 750

tested under the same conditions except that, to prevent removal of the zinc, the specimen was surrounded by an atmosphere of oxygen-free nitrogen and by a tube of the same composition as the specimen open only at the end through which the load was applied by a fine wire. There was no change of length of this specimen, and a micro-section showed no holes either at grain boundaries or within the grains. A test on a copper–0·2 per cent antimony alloy containing no zinc similarly produced no holes, although there was a slight extension of 1·3 per cent. Thus the presence of stress alone before or after the removal of zinc did not produce intergranular cracks. It can therefore be concluded that under these conditions of test the simultaneous action of stress and of excess of vacancies is necessary to produce holes and cracks forming preferentially at grain boundaries.

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Duration of Transients in Solar Radio Noise

Since February this year, high-speed records have been obtained at a frequency of 200 Mc./sec. during solar radio noise storms. The equipment used for the registrations consists of a receiver with bandwidth of 0·3 Mc./sec. and time constant 0·01 sec. and a Brush recorder. Records were secured at