REFERENCES

ALADAG, E., DAVIS, L. A., and GORDON, R. B., 1970, *Phil. Mag.*, **21**, 409.
COTTRELL, A. H., 1963, *Relation between Structure and Strength of Metals and Alloys* (London: H.M.S.O.), p. 456.
EVANS, R. A., REDFERN, B. A. W., and WRONSKI, A. S., 1970, *J. mater. Sci.*, **5**, 453.
GUTMANAS, E. YU., NADGORNYI, E. M., and STEPANOV, A. V., 1963, *Soviet Phys. solid St.*, **5**, 743.
HAHN, G. T., 1962, *Acta metall.*, **10**, 727.
MELLOR, H. G., and WRONSKI, A. S., 1970 a, *Acta metall.*, **18**, 765; 1970 b, *Metals Sci. J.*, **4**, 108.
JOHNSTON, W. S., and GILMAN, J. J., 1959, *J. appl. Phys.*, **30**, 129; 1960, *Ibid.*, **31**, 687.

Reprinted from
PHILOSOPHICAL MAGAZINE, Vol. 23, No. 183, p. 731, March 1971

Influence of Hydrostatic Pressure of the Flow Stress in Polycrystalline NaCl

By R. A. EVANS, B. A. W. REDFERN† and A. S. WRONSKI

School of Materials Science, University of Bradford,
Bradford, England

[Received 20 May 1970 and in revised form 30 September 1970]

ABSTRACT

By etch-pitting NaCl polycrystals which had been subjected to a hydrostatic pressure of 8 or 10 kbar it was established that dislocations are generated *during* the pressurization treatment. The effect of these freshly nucleated dislocations on the stress strain relationship at atmospheric pressure is established and the relevance of these observations to the interpretations of experiments carried out under pressure is discussed.

Aladag, Davis and Gordon (1970) have recently reported that the yield stress of polycrystalline sodium chloride is reduced by about 20% if the specimen is tested under a hydrostatic pressure of 10 kbar. Their material was ' seasoned ' at 10 kbar and then some specimens were compressed at atmospheric pressure whilst others were tested under pressure; results on unpressurized material were not reported. Aladag *et al.* attributed the difference in behaviour to increased ease of cross-slip at high pressure and did not consider the possibility of irreversible effects of the pressurization on the mechanical properties of sodium chloride. As solids with the cubic structure have isotropic linear compressibilities, local shear stresses should not be *expected* in the presence of grain boundaries on the application of hydrostatic pressure. It has, however, been demonstrated (Evans, Redfern and Wronski 1970) that dislocations are generated in the region of a tilt boundary in a bicrystal of NaCl subjected to a hydrostatic pressure of 10 kbar. It was accordingly decided to extend this investigation to NaCl polycrystals.

The specimens, of approximately square cross section ~ 10 mm high, were sectioned from polycrystalline AnalaR grade NaCl. Details of the experimental techniques have been previously reported (Evans *et al.* 1970). The total cation and anion impurity concentration was <20 p.p.m., which precludes the presence of precipitates and pre-precipitates. The grain sizes were not uniform, the average grain diameters being ~ 1 mm. Pressurizations were carried out at 8 and 10 kbar and compression testing on a modified Hounsfield tensometer at strain rates of $\sim 2 \times 10^{-4}$ sec^{-1} at atmospheric temperature and pressure. Etch-pitting experiments

† Now with the Railway Technical Centre, Derby, England.