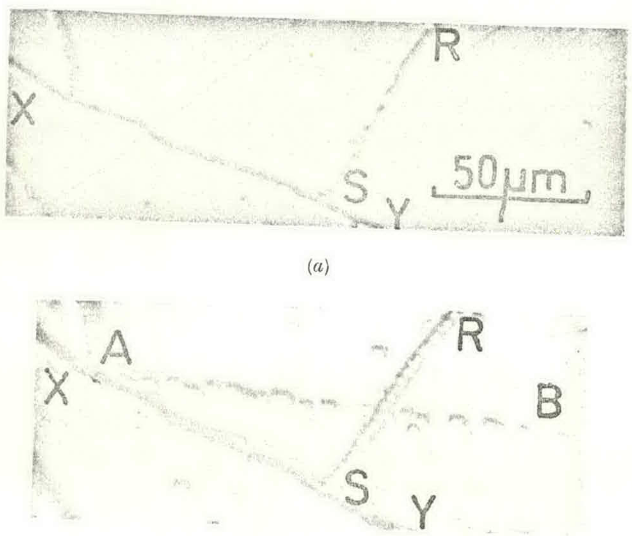
revealed that dislocations were generated, sometimes in well-defined ⟨110⟩ slip bands, near high angle boundaries whilst the specimens were subjected to the high hydrostatic pressure. Figure 1 illustrates a detail from a polycrystalline sample, where a {100} face has been etched before and after pressurization at 8 kbar. The edge dislocation etch-pit trace, AB, should be noted in particular; this motion arises, we suggest, from shear stresses developed from the grain boundary, XY.

Fig. 1



(*a*)

(*b*)

A {100} face of a NaCl polycrystal (*a*) before and (*b*) after pressurization at 8 kbar. In (*b*) note the line of screw dislocation etch pits AB, in ⟨100⟩, associated with the grain boundary XSY following the pressurization and crossing the sub-boundary RS.

Such a generation and motion of dislocations betoken a significant shear stress operating on the {110} planes in the sample interior. This stress must inevitably be in excess of 5–10 bar, which is the range of experimentally observed, critically resolved shear stresses in single crystals of similar purity.

The authors consider that these features of the pressurization treatment of NaCl samples have some significance in the discussion of the results of Aladag *et al.* (1970) on polycrystalline NaCl. We suggest that their

'seasoning' treatment at 10 kbar, given to all polycrystalline samples, may have introduced and activated dislocation sources, on the evidence from our present work. Such a dislocation activity will have an influence on any subsequent deformation which the crystal is required to undergo, in particular if free dislocations are present in all grains. It is to be expected that the flow stress of an unpressurized polycrystalline sample would be higher than of samples tested either subsequent to pressurization or at pressure, because of the absence of activated dislocation sources. Difference in behaviour in the last two conditions (reported by Aladag *et al.*) can be accounted for by considering that plastic flow in samples tested at 10 kbar is supported not only by the applied stress but also the inherent shear stresses due to the hydrostatic pressure near the grain boundary dislocation sources. Although the samples tested at atmospheric pressure contain mobile dislocations introduced during 'seasoning', the plastic flow is in this case supported solely by the applied shear stress resolved onto the active slip planes. The 20% reduction in yield stress, σ_Y, observed by these authors, may represent the contribution from the additional pressurization shear stresses.

In our mechanical properties investigations the yield stress in precipitate-free single crystals was found to be insensitive to pressurization, which is in line with the lack of dislocation generation in single crystals subjected to hydrostatic pressure (Evans *et al.* 1970). Yield stresses of unpressurized and pressurized polycrystals were also determined, but the scatter in the values of the yield stress of unpressurized samples (11–16 bar) precludes for the time being a quantitative evaluation of the effects of pressurization on as-annealed specimens. The confining pressure, however, was reported by Aladag *et al.* (1970) to influence the entire stress–strain relationship of a polycrystal; we suggest, *inter alia*, through the generation of dislocations. A quantitative test of this hypothesis, therefore, is the pressurization and compression of pre-compressed polycrystals. If fresh dislocations are generated by the high pressure treatment, the stress to re-initiate macroscopic plastic flow should be smaller than the stress reached in the test on an unpressurized sample.

These experiments were carried out and, for 10 kbar pressurizations, reductions in the flow stress of ~4 bar (20–40% σ_Y) were observed (e.g. fig. 2). By carrying out unload–reload experiments it was established that a real effect of pressurization was being studied. Pressurization of strained pure monocrystalline specimens did not result in a discernible effect on the flow stress.

An estimate of the number of new dislocations contributing to plastic flow in a pressurized polycrystal can be made using a modification of the model Johnston and Gilman (1959) proposed for the deformation of LiF monocrystals. Hahn (1962) and Cottrell (1963) extended the theory to the deformation of polycrystals of body-centred cubic transition metals and Mellor and Wronski (1970 a) recently used the same semiquantitative approach to interpret pressurization effects in polycrystalline chromium.