MATERIALS

The rocks and other materials studied are listed in Table 1. In the case of the sandstone and talc, all specimens were cored from single blocks in the same direction. Similarly all graphite specimens were turned from a single rod; X-ray texture goniometer measurements on it showed that about three times as many crystals had their basal planes parallel to the specimen axis as perpendicular to it. The sodium chloride specimens were fabricated with a standardized procedure in a piston–cylinder press, using a nominal pressure of 10 kb; they

TABLE 1. MATERIALS STUDIED

Material	Density (gm cm^{-2})	Porosity† (per cent)	Remarks
Lithographic limestone	2·56	5·9	Fine-grained (about 0·01 mm); isotropic‡ presumed to be Solenhofen limestone
Carrara marble	2·69	1·1	Grain size about 0·1 mm; isotropic‡
Gosford sandstone (New South Wales)	2·45	13	Weakly cemented quartz and felspar (about 0·2 mm grain size) in matrix of clay and mica; slightly anisotropic‡
Three Springs talc (West Australia)	2·71	3·2	Fine-grained; nearly isotropic‡
Graphite	1·73	25	Electrographite Grade EY9, supplied as rod by Morganite Carbon Ltd (Australia); anisotropic (see text)
Sodium chloride	2·15	0·5	Analytical reagent grade; fabricated by pressing (see text)

† Calculated from measured bulk density and known single crystal density; in the case of the sandstone, the mean of quartz and felspar is used for the latter.
‡ Based on stress–strain curves measured on mutually orthogonal specimens.

were not annealed since it was desired to reproduce possible conditions of usage in solid-medium high-pressure apparatus.

In the case of the sodium chloride, the powder was dried before fabrication of the specimens, and in the case of the other materials several weeks of air-drying had been allowed before testing. Otherwise, no special precautions about moisture content were taken.

RESULTS

Lithographic limestone

The stress–strain curves are given in Fig. 3(a) for compression tests at confining pressures from 1 to 8 kb and for extension tests at 6·5 kb. The corresponding relative volume change vs strain curves are given in Fig. 3(c). In these and subsequent figures the line marked 'scatter' indicates the range of scatter amongst repeat experiments which applies approximately to all the curves shown, the curves giving the average results. The relative volume change $\Delta v/v_0$ plotted is referred to the initial volume v_0 measured at atmospheric pressure.

The brittle–ductile transition, as defined by the change from a sharply-defined narrow shear to a widely-distributed deformation, occurs between 1 and 2 kb confining pressure in compression and is accompanied by a change from turning-over to continually-rising

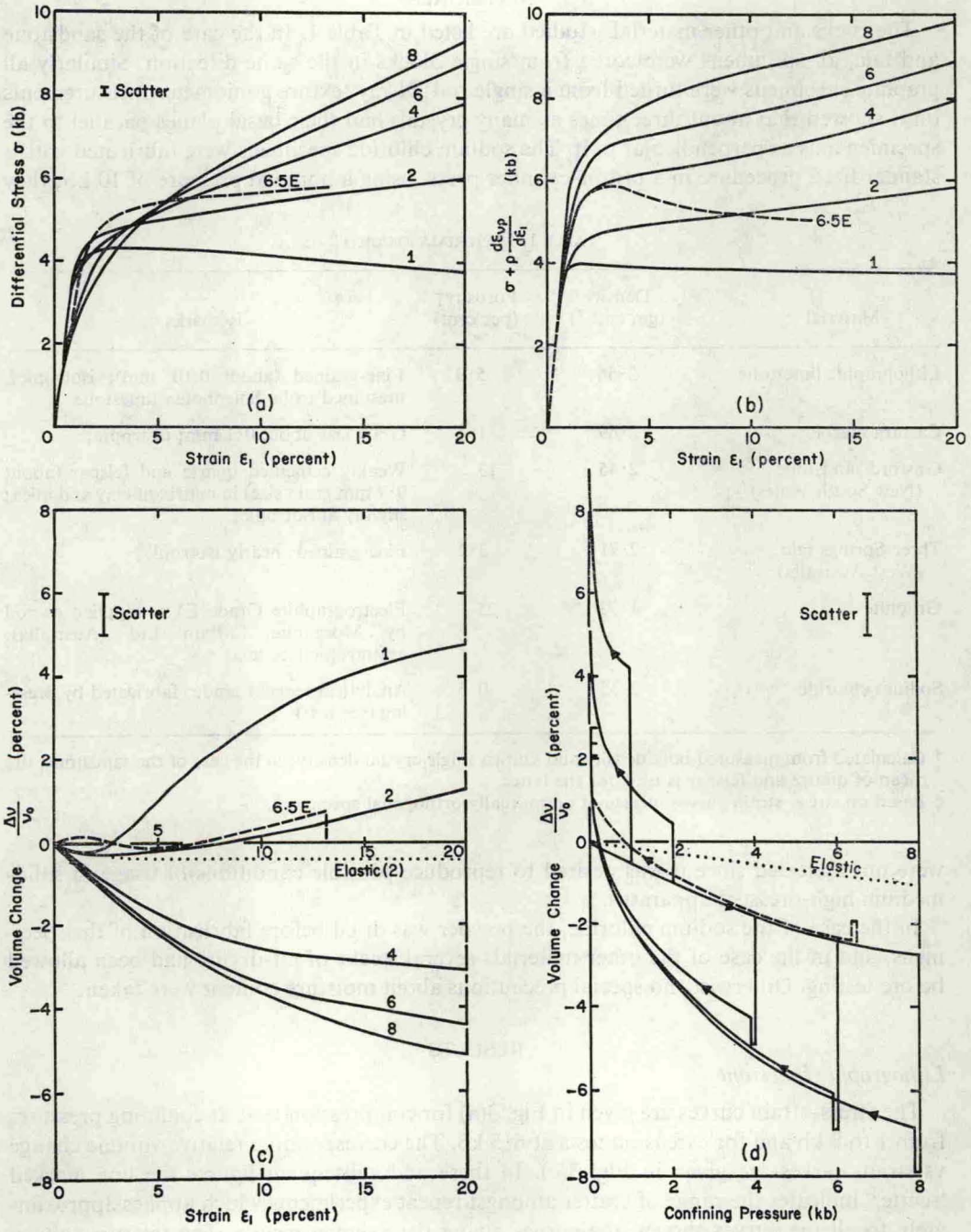

FIG. 3. Results for lithographic limestone: (a) stress–strain curves at confining pressures 1–8 kb (indicated on curves; 6·5 E is an extension test, all others in compression); (b) equivalent stress–strain curve calculated from total work done on specimen; (c) relative volume change vs strain at pressures indicated, corresponding to stress–strain curves in (a); (d) complete history of volume changes.