

strain-rate symmetry, as required in some theoretical formulations of ice flow laws, or to the symmetry of the strain, but it does conform to the symmetry of the 'movement picture' as defined in structural petrology. The experimentally produced recrystallization fabrics differ strikingly from fabrics of glacier ice, recrystallized naturally under comparable shear stresses.

(T73) • IRIS BORG, • JOHN W. HANDIN (Shell Development Company, Exploration and Production Research Div., Houston, Tex.), *Experimental Deformation of Micas*. Single crystals of biotite and mica-rich gneisses have been deformed in short term uniaxial tests at 500°C, 5-kb confining pressure. Ultimate strength of biotite compressed parallel to (001) is 0.08 kb. Deformation is by bendgliding on (001) resulting in prolific kink bands. Rotation axes (f) occur very near to [010], indicating that a slip line coincides with, or is near to, $t = [100]$. The measured spread of f and t about these axes is sufficient to suggest either an additional slip line is operative, e.g., $t = [130]$, $f = [110]$, or that slip occurs without a definite crystallographic direction. Both clockwise and counterclockwise rotations of (001) about a single f indicate two-sided glide. Symmetry rules out an equal facility in either sense, but the critical resolved shear stress must be nearly equal for the two. Kink band boundaries are $\{h01\}$ and $\{h\bar{0}1\}$, 51°-79° and 59°-73° from {001}. In the gneisses kinking occurs in micas in which (001) is at low angles to σ_1 ; in such grains kink band boundaries (kbb) occur statistically normal to σ_1 . Where the foliation s , defined by (001) concentrations, is at 45° to σ_1 , grains containing kinks comprise 37% of the total and are those whose c axes lie most nearly normal to σ_1 . In all cases where σ_1 departs by less than 45° from s , normals to kbb lie between σ_1 and s . Because of the wider range in positions kink bands can assume within a crystal, their attitude is a more useful variable than the c axes of the grains containing them in dynamic syntheses. Movement on kbb is a final phase of biotite deformation. It is associated with the attenuation and ultimate destruction of the crystalline entity.

(T74) • W. D. MEANS (Dept. of Earth and Atmospheric Sciences, State Univ. of New York, Albany), • M. S. PATERSON (Dept. of Geophysics and Geochemistry, Australian National University, Canberra, Australia), *Experiments on Preferred Orientation of Platy Minerals*. Polycrystalline aggregates of phlogopite, talc, and brucite have been grown hydrothermally from their constituent oxides at 300°-600°C, 3-5 kb, and compressed 10-30% in short-term experiments (typically 30 minutes). Under hydrostatic conditions, approximately random orientation of crystals results. When the specimen is strained, either during or after growth of the minerals, a preferred orientation of basal planes normal to the axis of compression results. Since straining at room temperature after growth of the minerals leads to a similar result, the mechanism of orientation is probably mainly mechanical rotation after formation. Microscope examination

showed that the preferred orientation is most marked in coarser grains of the aggregates. A second kind of foliation is defined in some specimens by closely spaced narrow domains within which coarse grains are slightly rotated. These domains occur in conjugate sets symmetrically oriented at about 45° to the axis of compression. They are interpreted as shear domains and are geometrically similar to a type of strain-slip cleavage in foliated rocks. The experiments may represent likely behavior in geological situations in which the temperature or time scale precludes recrystallization during deformation, but they are probably not directly relevant to cases of axial plane cleavage in which reorientation through an influence of stress or strain during recrystallization is believed to have occurred. No unequivocal evidence for the second process was obtained in the experiments.

(T75) • C. W. WEAVER • M. S. PATERSON (Dept. of Geophysics and Geochemistry, Australian National University, Canberra, Australia), *Deformation of Polycrystalline MgO at High Pressure*. Polycrystalline magnesium oxide is found to be ductile at room temperature at confining pressures above about 2 kb, but the stress-strain curve is still fairly pressure dependent in the ductile region. Because the von Mises-Taylor requirement of five independent slip systems for ductility is not satisfied by the normal NaCl slip system $\{110\}$ $\langle 110 \rangle$, additional modes of deformation can be expected. Thus some $\{110\}$ $\langle 110 \rangle$ slip is observed, increasing in amount with pressure, but possibly in insufficient amount to account wholly for the ductility. The substantial pressure dependence of the stress-strain curve is not fully understood but may arise from subsidiary cataclastic effects or from changes in the distribution of slip on the various systems with pressure. There also appears to be a strengthening effect from the rubber jackets used.

(T76) • KENNETH D. LYALL (Dept. of Mines and Technical Surveys, Fuels and Mining Practice Div., Ottawa, Canada), *The Origin of Mechanical Twinning in Galena*. Mechanical twinning with composition plane (441) can be produced experimentally in galena single crystals tested in compression at room temperature and high confining pressure, provided that the crystals have initial length to cross-section area ratio less than 0.7 and are oriented so that the resolved shear stress on all $\{001\} < 110 >$ slip systems is initially zero. (441) twinning can also be produced in crystals in the same orientation tested under impact. A study of the stress-strain behavior and the deformation mechanisms in eight other orientations of single crystals and in aggregates, plus a comparison of the morphology and annealing behavior of the experimentally produced twins with those observed in coarse-grained galena from Broken Hill, Australia, suggests (1) that the 'natural' (441) twins were produced by blasting during mining operations, and (2) that (441) mechanical twinning is an unlikely deformation mechanism at slow strain rates in the Earth's crust.

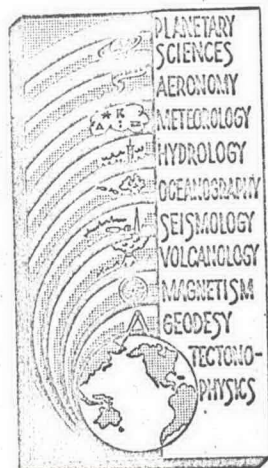
Frederick Room

(T77) • SHOSH SERATA (Dept. of Geology, Michigan State Univ.), *Experiments on Salt Formation*. A theoretical model for salt formation in an underground repository based on laboratory properties. Rock salt is a crystalline aggregate, analyzed by constructing the elastic, viscoelastic of the material. Both independent coefficient were determined under loading conditions creating machine development validity of the mathematical stress field was conducting experiments in three dimensions in the field of a circular cylinder formation located analyzed. The field was found to be in well as the laboratory that the stress field hydrostatic, uniform free from excessive results of the study generalized theory ground. A recent development of the underground surface as well as

(T78) • CHAPMAN (Stanford Univ.), *Location Theory*. A theoretical model for salt formation in an underground repository based on laboratory properties. Rock salt is a crystalline aggregate, analyzed by constructing the elastic, viscoelastic of the material. Both independent coefficient were determined under loading conditions creating machine development validity of the mathematical stress field was conducting experiments in three dimensions in the field of a circular cylinder formation located analyzed. The field was found to be in well as the laboratory that the stress field hydrostatic, uniform free from excessive results of the study generalized theory ground. A recent development of the underground surface as well as

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