dies heated by passing a high current through the walls. They reported the contraction of various carbides, borides and oxides as a function of temperature, and showed that reduction of particle size reduced the temperature needed for densification.

One of the difficulties of powder aggregation is the variation in density which may occur through the compact. This difficulty can be circumvented by isostatic pressing, and the use of a reversible gel, such as a polyvinyl polymer, as a mould material giving substantially true hydrostatic pressures up to 50 tons/in.² was described by Mr. T. W. Penrice (Production Tool Alloy Co.). The technique is evidently applicable to quite complicated shapes.

The analyst's outlook on the new materials was touched upon in a paper by Mr. H. Bennett (British Ceramic Research Association) on the chemical determination of nitrogen in refractory nitrides, which posed many new problems. The final paper was a description by J. Peyssou (C.S.F., France) of the possible variations of properties of ceramic articles caused by variations in firing conditions and methods of manufacture.

The symposium concluded with a tour of the laboratories of the British Ceramic Research Association. The proceedings of the symposium are to be published by Heywood and Co. as a book, "Special Ceramics", which is being edited by Mr. P. Popper. N. F. ASTBURY

SOLID STATE PHYSICS

A CONFERENCE was held at Melbourne on "Solid State Physics" during August 17-21 under the auspices of the Australian Branch of the Institute of Physics. Grants from Australian industry, learned societies, government organizations and universities and support by the United States Government research authorities, the United Kingdom Atomic Energy Authority and the Canadian Government enabled several Americans, a Canadian and three Englishmen to attend. Other States of the Commonwealth of Australia and New Zealand were well represented.

The matter was drawn from across almost the whole range of this enormous subject, and one could hope that it might set a style of conference where the programme would be not so specialized that only a few experts could really benefit.

The programme opened with a day devoted to low-temperature properties of metals and alloys. Precision lattice parameters, superconductivity and superfluidity, dislocation-phonon scattering and electron phonon drag effects were discussed. The changes of lattice parameter in bismuth on alloying set a challenge to the theorists, and the dislocation scattering of phonons seems still to be in error by a factor assessed as between three and seventy by one speaker.

Electron field emission, low-energy sputtering, epitaxial growth and dislocation barriers at surfaces served during the next day to remind those present just how little of the surfaces of solids is understood. The afternoon and following day were devoted to plasticity studies, when softening by adiabatic heating was used to explain the serrated load extension curves of iron at temperatures immediately above the brittle fracture region, as well as for aluminium at very low temperature. The dependence on orientation of work hardening and of slip-system geography in face-centred cubic metals were presented, and it was clearly the opinion of the majority that current theories are far too simple in their outlook. The Peierls-Nabarro force, its connexion with lattice friction, and the significance of the friction term in the hardening curves formed a recurrent theme in and out of the lecture room. Preliminary results indicate that reliable twin-fault densities may be obtained from the asymmetry of Bragg peaks and this may inject a little more knowledge of the deformed state. Measurements of the mechanical properties of the

alkali metals at very low temperatures, along with optical microscope studies, have confirmed the X-ray evidence of shear transformations in sodium and lithium, and have brought to light a great sensitivity to structural details in the transformation of the crystalline aggregate.

On the third day attention was swung to optical properties of solids, with papers on soft X-ray studies of the light metals, infra-red and optical absorption in ionic crystals. Dielectric properties of doped alkali halides, evidence for aggregation of *F* centres and new techniques and facts in luminescence studies were the subjects for the remainder of the day. The analysis of rare-earth spectra in crystals is getting steadily more detailed and very large-scale calculations are rapidly elucidating the details of interactions within the *f* electron-shell.

The last day saw an interesting mixture of papers: the dreadful maze into which theoretical physicists lead each other when the anharmonic terms leading to thermal expansion are studied was on show, as was the theory of zone structure in liquids. Here some progress seemed to be made for the one-dimensional model. The magnetic structure of metallic chromium and its alloys was discussed in terms of magnetic properties and neutron diffraction evidence. Then came the grand finale with one situation well on the way to elucidation and three well on the way to confusion. The ordering of α -brass at temperatures of about 135° C. has been most convincingly shown and will probably remove the few remaining anomalies in the properties of the α Cu-Zn phase in this temperature region. But in copper the first annealing observed after very low-temperature bombardment now occurs at only 7° K., and the atomic processes involved get steadily more mysterious. Polycrystalline calcite or 'marble' plastically uni-axially compressed at high hydrostatic pressure, largely recovers its axial dimensions on release of the hydrostatic pressure. In lithium fluoride as well as silicon iron, plastic hardening seems to denote a drop in dislocation speed under a given stress, indicating an increase in dislocation viscosity—or is it a drop in effective stress?

It was a stimulating conference, and those from overseas were impressed to find such a wealth of first-class work, enthusiasm and hospitality in this rapidly growing and developing continent of Australia.

W. M. LOMER