MEETINGS AND CONFERENCES

RELAXATION PHENOMENA IN SOLIDS

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R. I. GARBER

Physico-technical Institute, Academy of Sciences, Ukrainian S.S.R., Khar'kov

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THE state and the properties of solids are greatly influenced by external electric or magnetic fields, and by the elastic-stress field due to volume and surface forces applied to the body. The rate of penetration of external fields (electric, magnetic, elastic) into a solid is relatively large and, as a rule, it can be assumed that the changes in the field intensity occur without time lag. However, the time to establish a new state of the solid after application of a field is in all cases large enough to exhibit appreciable relaxation.

The main factors responsible for relaxation of solids are essentially the influence of thermal and electric resistance; the interaction of quasiparticles, electrons, phonons, etc.; and the presence of plane defects, dislocations, diffusion processes, and phase transformations. A great variety of combinations of the foregoing factors occur in solids, and this greatly complicates investigations of relaxation phenomena in such bodies. Traditionally separated branches of solid-state physics, such as crystal optics, magnetism, elasticity, etc., are most closely related when it comes to relaxation and internal friction. It is therefore not surprising that a scientific conference on relaxation phenomena in solids has attracted the attention of representatives of a large number of scientific research institutes, higher educational institutions, plant laboratories, design offices, and industry. More than four hundred participants from forty cities of the USSR and several foreign governments spent six days in plenary sessions and in seven sections to discuss approximately 270 papers and communications devoted to various aspects of the problem.

Review papers were read by V. S. Postnikov, G. V. Skrotskiĭ, G. P. Mikhaĭlov, G. M. Bartenev, and others. The sections dealt with the theory of relaxation phenomena in solids, mechanical-thermal relaxation in metals, internal friction and dispersion of the elastic moduli of metals, alloys, and low-molecular compounds, electromagnetic relaxation in solids, relaxation phenomena in high-molecular compounds, measurement methods and techniques, and instruments.

The theoretical research reported at the conference dealt with the theory of dielectric losses in polymers, dispersion of the dielectric constant, spin-spin relaxation, relaxation of the ordering parameter, paramagnetic absorption of electron-paramagnetic and nuclear-quadrupole resonance, spin-lattice absorption, multipole-multipole interaction, thermal and diffusion relaxation, inelastic oscillations of dislocations and the influence of point defects, relaxation in magnetic circuits with ferromagnets, relaxation near the phase transition temperature, internal friction, and elastic relaxation of various media. Altogether some forty theoretical papers were delivered.

Most experimental papers were devoted to internal friction in metals and alloys in a wide range of frequencies and temperatures. A prominent place was occupied by research on stress relaxation, creep, and elastic aftereffect.

Internal friction is a very sensitive characteristic of the solid state and is therefore used with great success for a variety of investigations on metals, alloys, and nonmetallic materials. Magnetic properties, dislocations and their mobility, point defects, work hardening, recovery and recrystallization, certain impurities, intergrain boundaries and block structure, processes occurring during creep, fatigue, influence of the medium in which various materials and articles are imbedded, radiation effects, thermal fatigue, properties of filamentary crystals, phase transformations, decay of solid solution, aging, influence of alloying impurities, metastable states, quenching and tempering, martensitic transformations, temper brittleness and cold brittleness—this is far from a complete list of the subjects that can be thoroughly investigated with the aid of internal friction. These methods are most important in investigations of properties of glass-like and crystalline polymers and of different plastics.

In the field of methodology and experimental techniques, an urgent need is felt for comprehensive measurements of various properties and characteristics of the investigated objects, something which unfortunately is frequently left undone.

Translated by J. G. Adashko