

not be determined by direct experiment. This model assumes that the grain boundary may be considered as a transition region consisting of numerous disordered groups of a few atoms less closely packed than the atoms in a regular crystal lattice. Between these imperfect groups we have regions of good lattice fit. The inter-crystalline slip occurs through the atomic rearrangement by thermal agitation within each disordered group by a shear process involving a few atoms as units of flow. This proposal is especially useful in predicting new experiments for the study of the creep of individual crystals of metals under small stress.

T.S.K.

A Grain Boundary Model and the Mechanism of Viscous Intercrystalline Slip. By T'ing-Sui Kê. *J. App. Phys.* 20: 274, March, 1949.

Magnetic Ion Source

A high intensity ion source is desirable for accelerator work because one may then study reactions with smaller yields than if lower beam currents are used. This is especially important at low energies where the yield of reactions is very small.

An ion source for Van de Graaff or similar particle accelerators has been constructed which produces a more intense beam of protons or deuterons than is usual. The ions are produced by bombarding hydrogen or deuterium with electrons from a filament. A magnetic beam parallel to the electron beam confines the ions and electrons produced to small spiral orbits and thus prevents the beam from spreading. The ions are produced in a region free of electric fields, and those which drift near a hole, opposite the entrance hole for the electron beam, are drawn out by a strong electric field and into the particle accelerator itself. Ion currents of more than five hundred microamperes of protons (separated from other constituents of the beam) have been obtained, as contrasted with about twenty microamperes for more conventional sources.

D.L.D.

A Magnetic Ion Source, by C. Bailey, D. L. Drukey, F. Oppenheimer. *Rev. Sci. Inst.* 20: 188, March, 1949.

Small Drops

In analyzing the kinetics of transitions between a liquid and its vapor it is important to know how the surface tension of small masses of the liquid depends upon their size and on the curvature of the boundaries separating them from the vapor from which they were formed. Embryos decay unless a critical size, depending upon surface tension, is exceeded.

The Gibbs thermodynamic theory of capillarity relates the surface tension of a spherical drop of liquid in contact with its vapor to the radius of the drop and a quantity called the superficial density, referred to the surface of tension. If the superficial density is positive, surface tension decreases with decreasing droplet size. If negative, the surface tension increases. Since the superficial density is difficult to measure, a theoretical investigation of its sign and magnitude is much to be desired.

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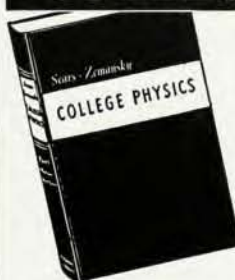
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In a series of three articles of which the present one is the last, Richard C. Tolman has presented a quasi-thermodynamic analysis of the structure of the transition zone between a liquid and its vapor which leads to the important conclusion that the superficial density is generally positive. Hence the surface tension of small drops is less than that when the liquid has a plane surface and decreases with decreasing droplet size. The effect is small but it is not negligible for embryo droplets in the borderline between the macroscopic and the microscopic. For drop radii of the order of magnitude of several hundred Angstrom units, decreases in surface tension of a few percent are to be expected in representative cases.

Tolman's analysis is based upon the hypothesis, which he recognized to be only approximately valid, that macroscopic thermodynamics can be applied to each layer of the transition zone between liquid and vapor. The thermodynamic functions are thus supposed to have values identical with those of the fluid in bulk appropriate to the given temperature and the local density of the layer.

JOHN G. KIRKWOOD

The Effect of Droplet Size on Surface Tension. By Richard C. Tolman. *J. Chem. Phys.* 17: 334, March, 1949.

Polymer Chains

The thousands of atoms in long chain polymer molecules are connected to one another by valance bonds about which they may rotate. The configuration of these molecules has customarily been studied by an analogy to the diffusion of a particle which moves about in successive displacements of equal length but in random directions. The diffusion problem and the polymer configuration problem differ, however, in one important respect not ordinarily taken into account. Whereas a diffusing particle may cross its previous path with impunity, there obviously cannot be a configuration in which two elements of the polymer chain occupy the same space. The modification of the configurational dimensions resulting from this stipulation has been investigated by an approximate statistical method and the results confirmed by numerous experiments.

P.J.F.

The Configuration of Real Polymer Chains. By Paul J. Flory. *J. Chem. Phys.* 17: 303, March, 1949.

Visual Ultrasonics

The problem of detecting and measuring the wavelength, intensity, and absorption of ultrasonic vibrations has been solved in a number of ingenious ways. Mechanical methods, involving the use of dust figures, the condensation of alcohol mist at the loops of stationary waves, and the measurement of sound radiation pressure by radiometers have been used frequently. Electrical and visual methods, however, are more versatile and have proved considerably more successful. The technique described in the present paper employs a visual method which appears capable of rather widespread application.