

BOOK REVIEW

Lattice Vibrations

By B. Donovan & J. F. Angress, Pp. 190, Chapman and Hall Ltd.,
London, £ 2.75.

Now-a-days lattice dynamics is a very fascinating subject and indeed, it is essential for the understanding of the various solid state properties. Both experimental and theoretical studies of the subject have advanced at an enormously fast rate during the past fifteen years. The present contribution by Donovan and Angress, a concise and compact presentation, appears to fill up the gap in the literature, created by the rapid progress of Solid State Physics. There exist, of course, a few advanced books dealing with lattice dynamics, but they are primarily intended for specialists in the subject while the present contribution will be helpful to common readers at an intermediate level having only the basic knowledge of solid state physics.

The field of lattice dynamics has been extended to such a stage that it will require an enormously large volume to cover every aspect of the subject. The authors have confined themselves to that part of the subject for which adiabatic approximation (also called Born-Oppenheimer approximation), in which motion of ion-cores and loosely bound valence electrons are separated out, is valid. The book thus mainly deals with the properties dependent on the lattice vibrations of insulating crystals leaving out other phenomena belonging properly to the theory of metals.

The introductory chapters discuss the classical and quantum mechanical foundations and include a description of lattice waves, acoustic frequency spectra and dispersion relations within the harmonic approximation. Anharmonic effects are also discussed in later chapters which also include phonon-phonon interaction, thermal properties, dielectric, ferro-electric and piezo-electric behaviours. The experimental determination of dispersion curves by X-ray and neutron scattering and the necessary theoretical formulations for such determination have been explained fairly in details. The final chapter deals with vibration of impurities and its effect on crystal properties.

The book, thus, is a concise but self-contained presentation of the various properties relating to lattice vibrations of insulating crystals.

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