

was obtained for the first time by L. D. Landau in 1937 with the aid of an expansion of the Boltzmann equation. Twenty years later it was independently constructed by M. Rosenbluth *et al.* starting with statistical considerations. Unfortunately, in the Introduction this side of the history of the problem has received no mention. The authors cite Ref. 2 as the primary source, although Ref. 1 is known to them.

## Excitons

A. P. Silin

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*Excitons: Selected Chapters.* Eds. E. I. Rashba and M. D. Sturge. North-Holland, Amsterdam; Oxford; New York; Tokyo (1987) pp. 485, (North-Holland Personal Library).

The book under review is dedicated to the 55th anniversary of exciton spectroscopy. The concept of an exciton was introduced in 1931 by Ya. I. Frenkel<sup>1</sup> for currentless electronic excitations associated with the correlation of the motion of electrons and holes. Excitons are divided into three fundamental types: Frenkel excitons, Wannier-Mott excitons and excitons associated with charge transport. At the present time excitons have been observed and investigated in all the basic types of nonmetallic crystals.

In the first chapter (the author is M. D. Sturge) basic concepts and definitions of exciton physics are introduced (Frenkel and Wannier-Mott excitons, polaritons, bound excitons, exciton complexes, exciton optical phenomena, exciton-phonon interaction), and also a brief historical review is given.

The following three chapters are devoted to the investigation of exciton polaritons. In the second chapter (J. L. Birman) electrodynamic of polaritons and non-local optical phenomena (response function, structure of a polariton mode, exciton-polariton spectroscopy) associated with them are examined. The third chapter (E. S. Koteles) is devoted to the experimental investigation of the dispersion of exciton-polaritons. The fourth chapter (E. L. Ivchenko) investigates the influence of spatial dispersion on the properties of exciton-polaritons (reflection and transmission spectra in massive and thin crystals, the influence of a magnetic field etc.).

The electrooptics of excitons (the Franz-Keldysh effect for simple and degenerate energy bands, exciton electroabsorption, etc.) is discussed in the fifth chapter (A. G. Aronov, A. S. Ioselevich).

On the whole the book under review is of great interest for a wide circle of readers who deal with the kinetics of plasma and who use numerical methods. In the Soviet literature this subject so far has not received sufficient attention.

<sup>1</sup>L. D. Landau, *Zh. Exp. Teor. Fiz.* **7**, 203 (1937).

<sup>2</sup>M. N. Rosenbluth, W. M. Macdonald, and D. L. Judd, *Phys. Rev.* **107**, 1 (1957).

Of great interest is the sixth chapter (V. B. Timofeev) in which free multiparticle exciton complexes in indirect gap semiconductors are investigated. Such complexes (exciton molecules and exciton trions) are analogous to ordinary molecules and molecular ions. The equilibrium of complexes with electron-hole liquid, and the effect on them of uniaxial pressure and magnetic field are examined.

Self-trapping of excitons is investigated in the seventh chapter (E. I. Rashba). The main models, classification and criteria of self-trapping are presented. Self-trapping in low-dimensional systems, the self-trapping rate, the contribution of self-trapping to optical spectra and other problems are investigated.

In the two concluding chapters Frenkel excitons are examined. Properties of excitons in magnetic insulators (optical properties of paramagnetic ions, exciton-magnon transitions, etc.) are investigated in the eighth chapter (Y. Tanabe, K. Aoyagi). The ninth chapter (M. V. Belousov) is devoted to an examination of electron-vibrational (vibronic) intramolecular excitations serving as excitons.

The authors of the book under review have examined practically all the problems of exciton physics (one should only regretfully note the absence of a very interesting, in our opinion, and rapidly developing at the same time field of investigation—excitons in semiconductor heterostructures and superlattices). Specialists involved in studying excitons will find reviews useful to themselves not only in their own narrow specialty, but will also be enriched by interesting data from neighboring fields. The review papers were written by well-known specialists in these fields. The book is excellently illustrated and contains an extensive, well-selected bibliography.

The contents of the book are of essential interest for a broad circle of theoreticians and experimenters specializing in solid state physics.