Heterojunctions and semiconductor superlattices

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Heterojunctions and Semiconductor Superlattices: Proceedings of the Winter School. Les Houches, France, March 12-21, 1985. Eds. G. Allan, G. Bastard, N. Boccara, M. Lannov, and M. Voos. Springer-Verlag, Berlin; Heidelberg; New York; London; Paris; Tokyo, 1986, pp. 253.

The book under review consists of lecturers given at the Winter School in Les Houches (France) which was held from 12 to 21 March 1985. This school was devoted to current problems of the physics of semiconductors—two-dimensional semiconductor systems (heterojunctions and superlattices), in particular, to the preparation of these systems, to the investigations of their basic properties and to

their utilization in micro- and optoelectronics.

The book consists of 5 parts. The first part contains an introductory lecture by L. Esaki devoted to the main stages of the investigation, achievements and prospects of the development of research on semiconductor heterostructures (superlattices and quantum wells).

The second part consists of two lectures devoted to the theoretical investigation of semiconductor heterostructures. The lecture by M. Altarelli is devoted to the study of electron properties of semiconductor superlattices, quantum wells and heterojunctions. The band structure, the Landau levels and also the impurity states and excitons for different heterostructures are calculated in the approximation of enveloping functions taking into account the band structure of semiconductor compounds of the A_3B_5 group. The lecture by F. Stern describes the properties of the current carriers in heterojunctions, in particular the level structure and the low-temperature transport phenomena in heterojunctions.

The third part (11 lectures) is devoted to the experimental investigation of heterostructures. The quantum Hall effect, the optics (including the far IR range), the magneto-optics, the Raman scattering by the free current carriers, the phonon spectra, the transport phenomena, etc., are discussed. We call attention to the lecture by J. Maan describing the properties of alloyed superlattices formed by a periodic alternation of the *n*- and *p*-type layers possibly separated by layers of the original semiconductor, the lecture of J. Marsin devoted to the investigation of the special features of stressed superlattices—a new class of superlattices composed of semiconductors with a large ($\gtrsim 1\%$) distortion of the lattice constants, and the lecture by I. Guldner which studies the properties of the HgTe-CdTe, which are of considerable interest in connection with their possible use as detectors of IR radiation.

The fourth contains 4 lectures devoted to the technology of semiconductor heterostructures—the molecular-beam epitaxy of compounds of the A_3B_5 and A_2B_6 groups and the organo-metallic epitaxy from the gas phase of compounds of the A_3B_5 group.

The last fifth part contains the lecture by B. Winter on the use of semiconductor heterostructures as field transitors.

The book being reviewed gives quite a complete idea concerning the exceptionally rapidly developing direction in solid-state physics which is at present attracting a great deal of attention—the physics of semiconductor heterostructures. The lectures were given by authors who are well-known specialists in these fields (G. Abstreiter, M. Altarelli, L. Esaki, L. Chang, H. Störmer, and others). The book is well illustrated (168 figures).

The contents of the book are of undoubted interest for a wide circle of theoreticians and experimentalists specializing in the solid-state physics.