Preface

The dramatic impact of low dimensional semiconductor structures on current and future device applications cannot be overstated. Research over the last decade has highlighted the use of quantum engineering to achieve previously unknown limits for device performance in research laboratories. The modified electronic structure of semiconductor quantum structures results in transport and optical properties, which differ from those of constituent bulk materials. The possibility to tailor properties, such as bandgap, strain, band offset etc., of two-dimensional (2D) semiconductors, e.g. quantum wells, for specific purposes has had an extensive impact on the electronics, which has resulted in a dramatic renewal process. For instance, 2D structures are today used in a large number of high speed electronics and optoelectronic applications (e.g. detectors, light emitting diodes, modulators, switches and lasers) and in daily life, in e.g. LED-based traffic lights, CD-players, cash registers.

The introduction of impurities, also in very small concentrations, in a semiconductor can change its optical and electrical properties entirely. This attribute of the semiconductor is utilized in the manifoldness of their applications. This fact constitutes the principal driving force for investigation of the properties of the impurities in semiconductors. While the impurities in bulk materials have been investigated for a long time, and their properties are fairly well established by now, the corresponding studies of impurities in quantum wells is a more recent research area. The reduction in dimensionality and symmetry for a confined defect and the effect of the confinement on the electronic particles constitute the background for the great deal of attention for this kind of structure.

In this book, the major progress on the investigations of impurities confined in quantum wells is reviewed. The emphasis is on the experimental side including various kinds of optical characterization, such as infrared spectroscopy, Raman measurements, luminescence characterization and perturbation spectroscopy, of confined donors and acceptors. Also the dynamical properties as derived from time resolved luminescence measurements are presented.

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