1. Record Nr. UNINA9910300371903321

Autore	Nowozin Tobias
Titolo	Self-Organized Quantum Dots for Memories : Electronic Properties and Carrier Dynamics / / by Tobias Nowozin
Pubbl/distr/stampa	Cham : , : Springer International Publishing : , : Imprint : Springer, , 2014
ISBN	3-319-01970-8
Edizione	[1st ed. 2014.]
Descrizione fisica	1 online resource (163 p.)
Collana	Springer Theses, Recognizing Outstanding Ph.D. Research, , 2190-5053
Disciplina	004.53
Soggetti	Semiconductors Nanotechnology Electronic circuits Computer storage devices Electronic Circuits and Devices Nanotechnology and Microengineering Memory Structures
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Doctoral thesis accepted by the Technical University, Berlin, Germany.
Nota di bibliografia	Includes bibliographical references.
Nota di contenuto	Fundamentals -- Charge carriers in quantum dots -- Coupling of QDs to 2D gases -- Measurement methods -- Electronic properties of and storage times in QDs -- Carrier dynamics in quantum dots coupled to a 2DHG -- Summary and Outlook -- Storage time as a function of the localization energy -- Experimental details - Setup -- Samples -- Sample Processing -- DLTS: Error of graphical analysis -- Extrapolation of storage times.
Sommario/riassunto	Today’s semiconductor memory market is divided between two types of memory: DRAM and Flash. Each has its own advantages and disadvantages. While DRAM is fast but volatile, Flash is non-volatile but slow. A memory system based on self-organized quantum dots (QDs) as storage node could combine the advantages of modern DRAM and Flash, thus merging the latter’s non-volatility with very fast write times. This thesis investigates the electronic properties of and carrier dynamics in self-organized quantum dots by means of time-resolved capacitance

spectroscopy and time-resolved current measurements. The first aim is to study the localization energy of various QD systems in order to assess the potential of increasing the storage time in QDs to non-volatility. Surprisingly, it is found that the major impact of carrier capture cross-sections of QDs is to influence, and at times counterbalance, carrier storage in addition to the localization energy. The second aim is to study the coupling between a layer of self-organized QDs and a two-dimensional hole gas (2DHG), which is relevant for the read-out process in memory systems. The investigation yields the discovery of the many-particle ground states in the QD ensemble. In addition to its technological relevance, the thesis also offers new insights into the fascinating field of nanostructure physics.