1. Record Nr. UNINA9910349473703321

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Titolo	Electrical and Optoelectronic Properties of the Nanodevices Composed of Two-Dimensional Materials : Graphene and Molybdenum (IV) Disulfide / / by Cheng-Hua Liu
Pubbl/distr/stampa	Singapore : , : Springer Singapore : , : Imprint : Springer, , 2018
ISBN	9789811313554 981-13-1355-5
Edizione	[1st ed. 2018.]
Descrizione fisica	1 online resource (XIII, 74 p. 49 illus., 42 illus. in color.)
Collana	Springer Theses, Recognizing Outstanding Ph.D. Research, , 2190-5053
Disciplina	620.5
Soggetti	Nanoscale science Nanoscience Nanostructures Nanotechnology Semiconductors Materials—Surfaces Thin films Nanoscale Science and Technology Nanotechnology and Microengineering Surfaces and Interfaces, Thin Films
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Introduction -- Theoretical background -- Experimental methods -- Distinctive magnetotransport of graphene p-n-p junctions via resist-free fabrication and controlled diffusion of metallic contact -- Observation of quantum Hall plateau-plateau transition and scaling behavior of the zeroth Landau level in graphene p-n-p junction -- Extrinsic Origin of Persistent Photoconductivity in Monolayer MoS2 Field Effect -- Conclusion.
Sommario/riassunto	This thesis focuses on the transport and magneto-transport properties of graphene p-n-p junctions, such as the pronounced quantum Hall effect, a well-defined plateau–plateau transition point, and scaling

behavior. In addition, it demonstrates persistent photoconductivity (PPC) in the monolayer MoS2 devices, an effect that can be attributed to random localized potential fluctuations in the devices. Further, it studies scaling behavior at zeroth Landau level and high performance of fractional values of quantum Hall plateaus in these graphene p-n-p devices. Moreover, it demonstrates a unique and efficient means of controlling the PPC effect in monolayer MoS2. This PPC effect may offer novel functionalities for MoS2-based optoelectronic applications in the future.