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Disciplina	546.72
Soggetti	Optical materials Electronics - Materials Surfaces (Physics) Interfaces (Physical sciences) Thin films Nanotechnology Nanoscience Nanostructures Microwaves Optical engineering Optical and Electronic Materials Surface and Interface Science, Thin Films Nanotechnology and Microengineering Nanoscale Science and Technology Microwaves, RF and Optical Engineering
Lingua di pubblicazione	Inglese
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Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references at the end of each chapters and index.
Nota di contenuto	Introduction -- Chemistry of Transition Metal Dichalcogenides -- Brief Review of Bulk TMDCs: Structure and Properties -- Fabrication of 2D TMDC -- Structure of Monolayer and Few-Layer TMDCs -- Band Structure of 2D TMDCs -- Raman Scattering Spectroscopy of 2D TMDCs -- Photoluminescence of 2D TMDC -- Excitons in 2D TMDCs -- Magnetism of 2D TMDCs -- Spin-Valley Coupling in 2D TMDCs --

Miscellaneous Phenomena -- Functionalization of 2D TMDCs -- TMDC Heterostructures -- Applications of 2D TMDCs.

Sommario/riassunto

This book summarizes the current status of theoretical and experimental progress in 2 dimensional graphene-like monolayers and few-layers of transition metal dichalcogenides (TMDCs). Semiconducting monolayer TMDCs, due to the presence of a direct gap, significantly extend the potential of low-dimensional nanomaterials for applications in nanoelectronics and nano-optoelectronics as well as flexible nano-electronics with unprecedented possibilities to control the gap by external stimuli. Strong quantum confinement results in extremely high exciton binding energies which forms an interesting platform for both fundamental studies and device applications. Breaking of spatial inversion symmetry in monolayers results in strong spin-valley coupling potentially leading to their use in valleytronics. Starting with the basic chemistry of transition metals, the reader is introduced to the rich field of transition metal dichalcogenides. After a chapter on three dimensional crystals and a description of top-down and bottom-up fabrication methods of few-layer and single layer structures, the fascinating world of two-dimensional TMDCs structures is presented with their unique atomic, electronic, and magnetic properties. The book covers in detail particular features associated with decreased dimensionality such as stability and phase-transitions in monolayers, the appearance of a direct gap, large binding energy of 2D excitons and trions and their dynamics, Raman scattering associated with decreased dimensionality, extraordinarily strong light-matter interaction, layer-dependent photoluminescence properties, new physics associated with the destruction of the spatial inversion symmetry of the bulk phase, spin-orbit and spin-valley couplings. The book concludes with chapters on engineered heterostructures and device applications such as a monolayer MoS2 transistor. Considering the explosive interest in physics and applications of two-dimensional materials, this book is a valuable source of information for material scientists and engineers working in the field as well as for the graduate students majoring in materials science.