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Nota di contenuto	Introduction -- Review: Electronic Band Structure and Interface Properties -- Review: Optoelectronic Response and Van der Waals Materials -- Experimental Techniques, Instruments, and Cryostat -- Material and Heterostructure Interface Characterization -- Photoresponse in Graphene-on- MoS 2 Heterostructures -- Switching Operation with Graphene-on- MoS 2 Heterostructures -- Bilayer-Graphene-on- MoS 2 Heterostructures -- Photoresponse and Photon Noise in BLG-MoS2 Hybrids -- Other Graphene, MoS2 Devices and Room Temperature Operations -- Conclusion and Outlook.
Sommario/riassunto	This thesis deals with the development and in-depth study of a new class of optoelectronic material platform comprising graphene and MoS_2, in which MoS_2 is used essentially to sensitize graphene and lead to unprecedently high gain and novel opto-electronic memory effects. The results presented here open up the possibility of designing a new class of photosensitive devices which can be utilized in various optoelectronic applications including biomedical sensing, astronomical sensing, optical communications, optical quantum information processing and in applications requiring low intensity photodetection and number resolved single photon detection. .