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Master Thesis Defense

Entitled

STUDY OF THE DETECTION AND THE EMISSION OF THZ WAVES IN MOS_2 MATERIAL

by

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Abstract

Terahertz (THz) technology is receiving a wide interest nowadays, developing more researches worldwide to emerge new devices based on the THz regime and overcoming the challenge of the remarkable THz-gap. This thesis is concerned with studying and developing new emerging materials with new structures in terms of THz waves. The main objective of this thesis is to examine how the MoS_2 material in nanoribbons structure detect and emit THz waves theoretically and experimentally in contrast to Graphene nanoribbon material. The theoretical model was used alongside the experimental setup to fully understand the behavior of the materials and to have a wider look at their structures. The theoretical calculations were introduced by applying two equations for ungated and gated materials, to study the different structures of the nanoribbon materials and their response to THz waves in terms of plasmon dispersion. The study showed that MoS_2 has descent THz properties in terms of plasmon dispersion, which confirms the potential of such material in THz applications. However, the Graphene material shows better properties and higher frequency values due to its zero bandgap and higher carrier mobility. The study also investigated the different response of these materials to THz waves experimentally. First, an investigation of the obtained materials using the Raman Spectroscopy was conducted. Then, the materials were investigated using the Attenuated Total Reflectance (ATR) to measure the plasmon frequency dispersion.

Keywords: Terahertz (THz) waves, Graphene, Molybdenum disulphide (MoS_2), nanoribbons, plasmon dispersion, plasmon dispersion decay, Raman Spectroscopy.