

ABSTRACT

The subject of this thesis is the study of graphene, both theoretically and experimentally. Graphene, a monolayer of sp^2 bonded carbon atoms in a honeycomb lattice, created surge in research activities during the last 6-7 years owing to its high current density, ballistic transport, chemical inertness, high thermal conductivity, optical transmittance, and super hydrophobicity at nanometer scale. Graphene is considered to be one of the miracle materials in the twenty-first century.

In the first part of this work, is carried out a theoretical study of graphene. Specifically, in the first chapter were studied the most important properties that make graphene unique as a material. In the same chapter were also studied the techniques that used for characterization. The second chapter examines the methods that used for manufacturing graphene and the third chapter presents some of the numerous applications.

Finally, in the second part of this work is carried out an experimental approach by measuring the permeability of graphite samples, which consists a bulk form of graphene. In detail, twenty graphite samples are manufactured of graphite flakes, which are photographed in a dark room. Then the photos are processed on the computer, using a special image processing program. In addition, the resulting data are collected and processed in order to form three useful charts, by using a special program for data processing. The conclusions from the interpretation of the charts are really useful and important.