Abstract

The work contains of 88 pages, 31 figures, 21 tables and 52 bibliographic titles.

The urgency of the work is conditioned by the need for new methods of lithography with a nanometer resolution and also in the study of new materials for various branches of science and technology.

The master thesis considers diagnostic and technological capabilities of a scanning probe microscopy. Different methods of scanning probe lithography are considered. Their capabilities, advantages and disadvantages are presented. An overview of the properties and methods of obtaining graphene oxide is given. The prospects for its application are described. The peculiarities of graphene oxide reduction by temperature annealing are established by means of an in-situ Kelvin- probe microscopy. The optimal parameters for this technological operation are established. Nanomechanical modification of graphene oxide flakes was carried out. The optimum parameters of tip-surface interaction are established for controlled mechanical modification of the graphene oxide flakes.

The aim of the study is the developed technique for controlled modification of graphene oxide plates and also obtaining information about changing their properties in real time.

The objects of the research are the methods of nanoscale modification and also real-time monitoring of the electrical properties of the surface of graphene oxide.

The subject of the study are the parameters of the interaction of the probe of an atomic-force microscope with the surface of the plates of graphene oxide and also the change in its properties during the reduction process.

The methods of research included measuring scanning probe microscope techniques, in particular atomic force microscopy, conducting microscopy, Kelvin probe force microscopy and mechanical scanning probe lithography.

Scientific novelty consists in determining the parameters of interaction of the probe with the surface of graphene oxide for mechanical modification, and in studying the

properties of its surface during annealing in real time using the Kelvin probe force microscopy.

The results of scientific research were presented in the conference "Lashkarov`s Readings 2018" and in the journal "Semiconductor Physics, Quantum Electronics and Optoelectronics"

Keywords: scanning probe microscope, atomic force microscope, Kelvin probe force microscopy, conductive atomic force microscopy, scanning probe lithography, nanolithography, graphene oxide, reduced graphene oxide.