

Functional devices based on graphene

PhD. Student Eng. Mariana Mihaela Apostol

PhD. Advisor Prof. Ecaterina Andronescu

Abstract

The doctoral thesis titled "**Functional Devices Based on Graphene**" *aims to grow graphene with controlled characteristics using the chemical vapor deposition (CVD) method on a copper catalyst substrate. In the process, methane was used as the carbon source, and the obtained graphene was used for the development of devices, including those for detecting molecules of biological interest.* Accordingly, in line with this main objective, the doctoral thesis makes original contributions in the following areas: (i) optimization of the growth parameters in the CVD process to determine the optimal conditions for obtaining high-quality graphene with controlled thickness; (ii) preparation and characterization of the ZnO/graphene nanowire heterostructure, combining the CVD method with electrodeposition and electrochemical transfer (this ZnO/G heterostructure is an intriguing combination of materials due to both components exhibiting excellent electronic and optoelectronic properties, thereby paving the way for a variety of applications, including photocatalysis, supercapacitors, sensors, and solar cells); (iii) obtaining double-layer and multi-layer graphene through CVD to be used as a substrate for the adhesion and differentiation of fibroblast cells with the goal of evaluating its potential use as an electrode in medical electronic devices, as a conductive interface between synthetic and biological phases; (iv) development of graphene-based devices that can be used in biomedical applications such as electrochemical immunosensors for the detection of prostate-specific antigen (PSA).