

Abstract

Transfer of graphene films for development of graphene based electrodes

The isolation of graphene in 2004 paved the way into the era of two-dimensional materials. In 2010 A. Geim and K.S. Novoselov were awarded the Nobel Physics prize for the isolation and study of a single sheet of graphite. Since then, tremendous progress has been achieved in graphene growth technology making large-scale graphene growth feasible. Due to its very good mechanical properties, transmittance, conductivity and increasingly lower production cost, graphene is considered one of the most attractive materials for use as transparent conducting electrode in applications such as Organic Light Emitting Diodes (OLEDs) as well as Organic Photovoltaics (OPVs). Despite the fast technological progress, integration of graphene in such applications faces several challenges, the most important being the transfer of graphene, from growth substrates, onto substrates suitable for device fabrication.

The basic aim of this work was the development of a transfer method for graphene grown on metal evaporated wafers. The first two chapters constitute the theoretical part. The first chapter includes an introduction to graphene, a description of graphene growth by Chemical Vapor Deposition and a review of the most important graphene transfer methods according to literature. The second chapter includes a description of the characterization methods employed, as well as some basic elements of Raman spectroscopy in graphene. The experimental part includes chapters three to seven. Chapter three describes the experimental conditions of graphene growth by Chemical Vapor Deposition. Chapter four includes the development of three graphene transfer methods and their comparison. Chapter five includes a study of mechanical stresses and doping in transferred graphene films by Raman spectroscopy. In chapter six, multilayer graphene transfer is performed and the sample is characterized, while in chapter seven we study the experimental conditions for ultrafast laser scribing of multilayer graphene.