A Multi- and few-layer graphene growth on Si(100) by pulsed laser deposition

Trason W. Carter, **Saidjafarzoda Ilhom**, Khomidkhodza Kholikov, Zachary Thomas, Ali O. Er
Department of Physics and Astronomy, Western Kentucky University, Bowling Green, KY, USA 42101

Abstract

Graphene is a single layer of carbon atoms arranged in a hexagonal crystal structure with unlimited applications in materials science, condensed matter physics, biological and optical engineering, due to its excellent electrical and thermal properties. A multi- and few-layer graphene were successfully prepared by pulsed laser exfoliation of highly ordered pyrolytic graphite (HOPG) using nanosecond pulsed Nd:YAG laser operating at 1064 nm wavelength at 10 Hz. The effect of laser energy density, substrate temperatures, wavelength, and background pressures were investigated. Scanning electron microscopy (SEM) and atomic force microscopy (AFM) were used to analyze the topography and thickness of the films. AFM and SEM measurements showed that amorphous carbon, few-layer graphene and thin graphite films were formed as the laser power increased. Thin film deposition using 532 nm pulses produced better quality films compared to 1064 nm pulses. This study presents new insights to better understand the growth mechanism of graphene via laser exfoliation; an alternative, controllable and efficient synthesis route.