310
Accession number:20123115295610
Title:Optical and structural characterization of epitaxial graphene on vicinal 6H-SiC(0001)-Si by spectroscopic ellipsometry, Auger spectroscopy, and STM
Authors:Nelson, Florence (1); Sandin, Andreas (2); Dougherty, Daniel B. (2); Aspnes, David E. (2); Rowe, Jack E. (2); Diebold, Alain C. (1)
Author affiliation:(1) College of Nanoscale Science and Engineering, State University at Albany, Albany, NY 12203, United States; (2) Department of Physics, North Carolina State University, Raleigh, NC 27695, United States
Corresponding author:Nelson, F.(fnelson@albany.edu)
Source title:Journal of Vacuum Science and Technology B: Microelectronics and Nanometer Structures
Abbreviated source title:J Vac Sci Technol B Microelectron Nanometer Struct
Volume:30
Issue:4
Issue date:July 2012
Publication year:2012
Article number:04E106
Language:English
ISSN:10711023
CODEN:JVTBD9
Document type:Journal article (JA)
Publisher:AVS Science and Technology Society, 120 Wall Street, 32nd Floor, New York, NY 10005-3993, United States
Abstract:The authors report results of spectroscopic ellipsometry (SE) measurements in the near-IR, visible, and near-UV spectral ranges using a Woollam dual rotating-compensator ellipsometer, analyzing data in terms of both epitaxial graphene and interface contributions. The SiC samples were cleaned by standard methods of CMP and HF etching prior to mounting in UHV and growing epitaxial graphene by thermal annealing at ∼1400 °C. Most samples were vicinally cut 3.5° off (0001) toward [11-20]. STM measurements show that the initial regular step edges were replaced by somewhat irregular edges after graphene growth. From growth-temperature and Auger data the authors estimate that the graphene is ∼3-4 ML thick. The authors find significant differences among the spectral features of the interface "buffer" layer and those of graphene. Specifically, the hyperbolic-exciton peak reported previously at ∼4.5 eV in graphene shifts to a similarly shaped peak at ∼4 eV in the interface buffer layer. The authors attribute this shift to a significant component of sp³ bonded carbon in the buffer, which occurs in addition to the sp² bonded carbon that is present in the graphene layer. SE data in the terahertz range obtained by Hoffman [Thin Solid Films 519, 2593 (2011)] show that the mobility values of graphene grown on the carbon face of SiC vary with proximity to the substrate. This leads to the question as to whether an interface layer at the Si face has properties (i.e., dielectric function/complex refractive index) that are different from and/or affect those of the graphene layers. © 2012 American Vacuum Society.
Number of references:24
Main heading:Graphene

Controlled terms:Carbon films - Epitaxial growth - Refractive index - Silicon - Silicon carbide - Spectroscopic ellipsometry
Uncontrolled terms:Auger spectroscopy - Dielectric functions - Ellipsometers - Epitaxial graphene - Graphene growth - Graphene layers - HF etching - Interface layer - Mobility value - Near-IR - Spectral feature - Spectral range - Standard method - Step edge - Structural characterization - Terahertz range - Thermal-annealing - Thin solid film
Classification code:813 Coatings and Finishes - 804.2 Inorganic Compounds - 804 Chemical Products Generally - 941.4 Optical Variables Measurements - 761 Nanotechnology - 712.1.1 Single Element Semiconducting Materials - 712 Electronic and Thermionic Materials - 741.1 Light/Optics
DOI:10.1116/1.4726199
Database:Compendex