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Abstract

A study of 4H-SiC annealing temperature was performed using a rf-induction furnace in order to determined the optimal conditions to obtain suitable graphene layers. The graphene layer has been identified and confirmed by electrical measurements and physico-chemical analyses using Atomic Force Microscopy, X-Ray Photoelectron Spectroscopy and Infra-Red reflection measurements. GFET (Graphene Field-Effect Transistors) planar structure has been fabricated, with source and drain contacts formed directly on the graphene by lift-off. For the insulating gate, SiO_2 layers have been deposited by sputtering. The graphene layers have been investigated by electrochemical detection with $Fe_3(CN)_6$, $Ru(NH_3)_6$ and Catechol. Graphene electrodes have also been tested as transducers for biosensors, with acetylthiocholine (AChE), allowing this electrode to detect inhibitors of neurotransmitters. This study demonstrates the ability to include epitaxially grown graphene at the surface of SiC as a channel for the development of transistors, and it shows the efficiency of this layer playing the role of electrode in electrochemistry and that of transducer in biosensing. In addition, these results provide a very promising perspective for the elaboration of ISFETs with a similar graphene synthesis.

"Keywords: GFET, graphene, transistor, SiC, biosensor ;"