On the use of two dimensional hexagonal boron nitride as dielectric

Fei Hui, Chengbin Pan, Yuanyuan Shi, Yanfeng Ji, Enric Grustan-Gutierrez, Mario Lanza

PII: S0167-9317(16)30338-0
DOI: doi: 10.1016/j.mee.2016.06.015
Reference: MEE 10309

To appear in:

Received date: 25 February 2016
Revised date: 12 June 2016
Accepted date: 18 June 2016

Please cite this article as: Fei Hui, Chengbin Pan, Yuanyuan Shi, Yanfeng Ji, Enric Grustan-Gutierrez, Mario Lanza, On the use of two dimensional hexagonal boron nitride as dielectric, (2016), doi: 10.1016/j.mee.2016.06.015

On the use of two dimensional hexagonal boron nitride as dielectric

Fei Hui, Chengbin Pan, Yuanyuan Shi, Yanfeng Ji, Enric Grustan-Gutierrez, Mario Lanza*

Institute of Functional Nano & Soft Materials, Collaborative Innovation Center for Nano Science and Technology, Soochow University, 199 Ren-Ai Road, Suzhou, 215123, China

* Corresponding author Email: mlanza@suda.edu.cn

Abstract

Recent advances in materials science allowed the incorporation of advanced two dimensional (2D) materials in electronic devices. For example, field effect transistors (FETs) using graphene channels have shown unprecedented carrier mobility at room temperature, which is further complemented by its intrinsic flexibility, transparency, chemical stability and even thermal heat dissipation. Other 2D materials such as transition metal dichalcogenides (TMD) can provide additional functionalities to the devices, such as band gap induced high ON/OFF ratios in FETs. Interestingly, these 2D metallic (graphene) and 2D semiconducting materials (2D/TMDs) have been mainly implemented in devices using traditional three dimensional (3D) insulators, such as HfO_2, Al_2O_3 and SiO_2, which may not be the best solution given the complex and defective interface bonding. For this reason recently 2D insulators have been started to be used as dielectric in different electronic devices, showing interesting phenomena. A 2D insulator differs from traditional 3D insulators in that it holds a layered structure, in which the bonding in plane is covalent while the plane-to-plane interaction is governed by van der Waals interactions. This genuine structure has been demonstrated to remarkably alter some reliability phenomena like, for example, the entire