Accepted Manuscript

Electrical characterization of top-gated molybdenum disulfide field-effect-transistors with high-k dielectrics

Pavel Bolshakov, Peng Zhao, Angelica Azcatl, Paul K. Hurley, Robert M. Wallace, Chadwin D. Young

PII: S0167-9317(17)30190-9
DOI: doi: 10.1016/j.mee.2017.04.045
Reference: MEE 10550

To appear in: *Microelectronic Engineering*

Received date: 23 February 2017
Revised date: 10 April 2017
Accepted date: 27 April 2017

Please cite this article as: Pavel Bolshakov, Peng Zhao, Angelica Azcatl, Paul K. Hurley, Robert M. Wallace, Chadwin D. Young , Electrical characterization of top-gated molybdenum disulfide field-effect-transistors with high-k dielectrics, *Microelectronic Engineering* (2017), doi: 10.1016/j.mee.2017.04.045

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Electrical characterization of top-gated molybdenum disulfide field-effect-transistors with high-k dielectrics

Pavel Bolshakov(1)*, Peng Zhao(1), Angelica Azcatl(1), Paul K. Hurley(2), Robert M. Wallace(1), and Chadwin D. Young(1)

[1]*Department of Materials Science and Engineering, The University of Texas at Dallas, 800 West Campbell Road, Richardson, Texas 75080, USA*

[2]*Tyndall National Institute, University College Cork, Lee Maltings Complex, Dyke Parade, Mardyke, Cork, Ireland*

*Corresponding author, pavel.bolshakov@utdallas.edu

Abstract

High quality HfO_2 and Al_2O_3 substrates are fabricated in order to study their impact on top-gate MoS_2 transistors. Compared with top-gate MoS_2 FETs on a SiO_2 substrate, the field effect mobility decreased for devices on HfO_2 substrates but substantially increased for devices on Al_2O_3 substrates, possibly due to substrate surface roughness. A forming gas anneal is found to enhance device performance due to a reduction in charge trap density of the high-k substrates. The major improvements in device performance are ascribed to the forming gas anneal. Top-gate devices built upon Al_2O_3 substrates exhibit a near-ideal subthreshold swing (SS) of ~69 mV/dec and a ~10× increase in field effect mobility, indicating a positive influence on top-gate device performance even without any backside bias.

Keywords: MoS_2; top-gated transistor; HfO_2; Al_2O_3; high-k; substrate;

ACCEPTED MANUSCRIPT

Download English Version:

https://daneshyari.com/en/article/4970843

Download Persian Version:

https://daneshyari.com/article/4970843

Daneshyari.com