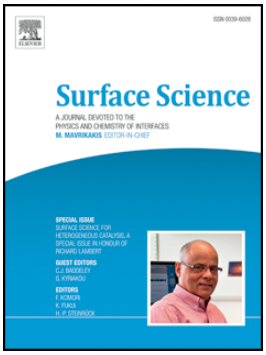

Dependence of electrostatic potential distribution of Al_2O_3/Ge structure on Al_2O_3 thickness

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PII: S0039-6028(16)30072-3
DOI: doi: 10.1016/j.susc.2016.04.001
Reference: SUSC 20863

To appear in: *Surface Science*

Received date: 4 February 2016
Revised date: 3 April 2016
Accepted date: 4 April 2016

Please cite this article as: Xiaolei Wang, Jinjuan Xiang, Wenwu Wang, Chao Zhao, Jing Zhang, Dependence of electrostatic potential distribution of Al_2O_3/Ge structure on Al_2O_3 thickness, *Surface Science* (2016), doi: 10.1016/j.susc.2016.04.001

Dependence of electrostatic potential distribution ~~band alignment~~ of Al_2O_3/Ge structure on Al_2O_3 thickness

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Abstract: Electrostatic potential distribution ~~Band alignment~~ of Al_2O_3/Ge structure is investigated vs. Al_2O_3 thickness by X-ray photoelectron spectroscopy (XPS). The electrostatic potential distribution ~~band alignment~~ is found to be Al_2O_3 thickness dependent ~~and the valence band offset increases with thicker Al_2O_3~~. This interesting phenomenon is attributed to the appearance of gap states on Al_2O_3 surface (GS_{Al2O3}) and its higher charge neutrality level (CNL) compared with the CNL of gap states at Al_2O_3/Ge interface ($GS_{Al2O3/Ge}$), leading to electron transfer from GS_{Al2O3} to $GS_{Al2O3/Ge}$. In the case of thicker Al_2O_3, fewer electrons transfer from GS_{Al2O3} to $GS_{Al2O3/Ge}$, resulting in a larger potential drop across Al_2O_3 and XPS results.

Key words: band alignment; Electrostatic potential distribution; X-ray photoelectron spectroscopy; Germanium; high-k dielectric; charge neutrality level.