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Strong Fermi-Level Pinning at Intact Metal/Si Interface Formed with Graphene Diffusion Barrier[1] KIBOG PARK, HOON HAHN YOON, SUNGCHUL JUNG, GAHYUN CHOI, JUNHYUNG KIM, YOUNGEUN JEON, Ulsan National Institute of Science and Technology, YONG SOO KIM, University of Ulsan, HU YOUNG JEONG, KWANPYO KIM, SOON-YONG KWON, Ulsan National Institute of Science and Technology — We report the systematic experimental studies demonstrating that a graphene layer inserted at Metal/n-Si(001) interface can protect the Schottky junction efficiently from unwanted changes in electrical properties. High-resolution transmission electron microscopy (HRTEM) images support the conjecture of the inserted graphene layer preventing the atomic inter-diffusion at interface. Especially, the reverse-bias leakage current of Metal/Graphene/n-Si(001) junction is found to be noticeably smaller than that of Metal/n-Si(001) junction, strongly supporting the role of graphene insertion layer as an efficient diffusion barrier. The internal photoemission (IPE) measurements show unambiguously that the Schottky barrier of Metal/Graphene/n-Si(001) junction is almost independent of metal work-function, implying very strong Fermi-level pinning at interface. The atomically-impermeable and electronically-transparent aspects of the graphene insertion layer can provide a reliable experimental method to form an intact Schottky contact for all semiconductors in general.

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