

Graphene for Electronic Devices

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Graphene has been considered as one of the candidate materials to extend Si-technology due to its unique electronic properties including high carrier mobilities. However, graphene has no bandgap and it is difficult to achieve high I_{On}/I_{Off} ratio, one of the most important requirements for electronic devices. Recently, we proposed and demonstrated a new device structure, Barristor, based on one of the unique properties of graphene, work function tunability. [1] The key feature of the device is the modulation of Schottky barrier height between Graphene-Si through the gate voltage modulation. Our device has major advantages over previously investigated graphene field effect transistors (FET). Large I_{On}/I_{Off} ratio of 10^5 can be achieved. It has no fundamental issues on mobility degradations, since our device does not alter the given properties of graphene. In addition, our device is fully compatible with current Si technology and we were able to fabricate the devices with 6 inch wafer scale with CVD (Chemical Vapor Deposition) grown graphene.

In this presentation, we will discuss about the details of Barristor including the device characteristics. We will also present recently developed vertical transistor based on asymmetric junctions. In addition, we will discuss the current issues on wafer scale developments and their potential solutions. Finally, we will cover the potential applications of graphene within semiconductor industry.

[1] H. Yang, J. Heo, S. Park, H. J. Song, D. H. Seo, K.-E. Byun, P. Kim, I. Yoo, H.-J. Chung, and K. Kim, **336** (6085), pp 1140-3 (2012)