2-Dimensional Layered Materials for Si Technology

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Two dimensional (2D) materials are crystalline materials with layered structures, including Graphene, h-BN, and Transition Metal Di-chalcogenides (TMD's). Each of their layers is consisting of one or a few atomic layers and they form van der Waals interactions with neighboring layers. Recently, they have been studied intensively due to their extraordinary properties, such as, flexibility and transparency. In addition, they have exceptional electronic, optoelectronic, chemical and mechanical properties. For example, Graphene has high electron mobility, chemical inertness, and thermal conductivity, while TMD has high photo responsivity. Based on their properties, many potential applications were proposed and demonstrated.

We have been investigated 2D layered materials for Si technology. We have focused 2D layered materials as interface materials due to the chemical inertness and their atomically thin nature. Especially, Graphene has been suggested as a promising material for future interconnects between devices because of its unique electrical and chemical properties. For instance, they are good candidates for diffusion barrier.[1] Also, they are good candidates for interface materials between metal and Si to reduce the Schottky barrier heights and contact resistance in source and drain, which is one of the most critical issues for scaling down.[2]

In this talk, we will cover and discuss the possibility of Graphene and other 2D layered materials for interconnects and contact resistance reducer in Si technology. In addition, we will also cover other potential applications based on 2D materials' unique properties, such as, chemical inertness and atomic thick nature.

References

[1] L.Li et al., ACS Nano, **9** (2015) pp. 8361-8367.
[2] K.-E. Byun et al., Nano Letters, **13** (2013) pp. 4001-4005