2D/3D Heterostructure Diodes for High Performance Electronics and Optoelectronics

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Abstract

Diodes made of heterostructures of the 2D material graphene and conventional 3D materials will be reviewed in this talk, with several applications in high frequency electronics and optoelectronics highlighted. In particular, advantages of metal–insulator–graphene (MIG) diodes over conventional metal–insulator–metal diodes are discussed with respect to relevant figures-of-merit.[1] The MIG concept is extended to 1D diodes, with a demonstration in energy harvesting application.[2,3] Several experimentally implemented radio frequency circuit applications with MIG diodes as active elements are presented.[4] Furthermore, graphene-silicon Schottky diodes as well as MIG diodes are reviewed on their potential for photodetection.[5,6] Here, graphene-based diodes have the potential to outperform conventional photodetectors in several key figures-of-merit, such as overall responsivity or dark current levels. Obviously, advantages in some areas may come at the cost of disadvantages in others, so that 2D/3D diodes need to be tailored in application-specific ways.

References

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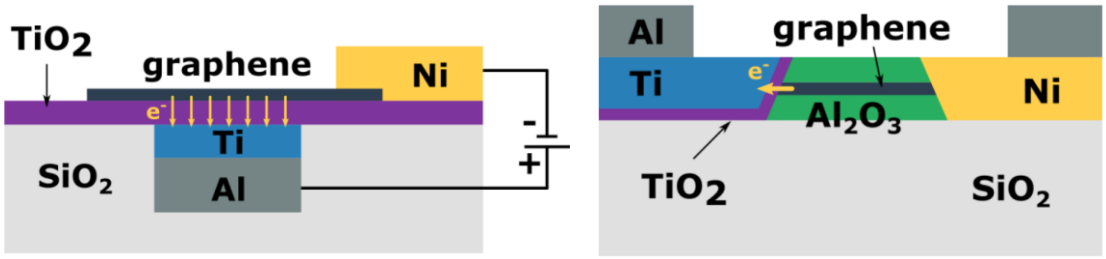
Figures



(a) (b)

Figure 1: Structure of MIG diodes. (a) 2-dimensional MIG diode, (b) 1-dimensional MIG diode. [7]