Keynote speaker

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More-than-Moore miniaturisation with graphene and cubic silicon carbide

It is well known that harnessing graphene's properties on a silicon platform could deliver a broad range of novel miniaturized and reconfigurable functionalities. It is less known that some key functionalities for MEMS/NEMS, nano-optics and metasurfaces can be uniquely unlocked by the combination of graphene and silicon carbide [1, 2, 3].

Over the last decade, we have developed an epitaxial graphene on silicon carbide on silicon technology that inherently delivers both capabilities. This platform allows to fabricate any complex graphene flat or 3D nanopattern in a site – selective fashion, ie without etching of the graphene, at the wafer -scale and with sufficient adhesion for integration [1, 4].

We will review the learnings from the development of this technology and some of its most promising applications. We show that the sheet resistance of epitaxial graphene on 3C-SiC on silicon is comparable to that of epitaxial graphene on SiC wafers, despite substantially smaller grains. We also indicate that the control of the graphene interfaces, particularly when integrated, can be a more important factor than achieving large grain sizes [5]. In addition, we show that well- engineered defects in graphene are preferable to defect -free graphene for most electrochemical applications. Promising examples of application of this technology in the More- than -Moore domain include integrated energy storage [6], MIR sensing and detection [7], and sensors for electro-encephalography [8, 9] for brain-computer interfaces [10].

References

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