

Platforms to develop 2D materials integrated with Si

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The development of silicon semiconductor technology has produced breakthroughs in electronics by downscaling the physical size of devices and wires to the nanometre scale. Now, two-dimensional (2D) materials offer prospects in advanced device performance at the atomic limit. Nevertheless, large area co-integration of 2D materials with Si platforms is challenging and progressing at a slow pace suffering from limited reproducibility and a gap between results achieved on encapsulated flakes and synthetic materials.

In this presentation we will discuss the processing challenges that we need to research to mature the integration and access the semiconductor standards.

- Different wafer level 2D-material growth methods are discussed and benchmarked.
- A fully automated transfer method will be discussed, and remaining challenges are addressed.
- Finally, we established an integration module for 2D materials in the 300mm line. We demonstrate the integration of MX_2 -based transistors using standard state of the art production tools.

We will demonstrate integrated devices where 2D material was directly deposited or growth on a template surface and transferred to the pre-processed target wafer. The major integration challenges are the limited adhesion, the fragility of the (few)monolayer 2D material and the control of the local doping level in 2D materials.

References

- [1] Authors, Journal, Issue (Year) page (Century Gothic 11) Indicate references with sequential numbers within [square brackets].
- [2] Authors, Journal, Issue (Year) page
- [3] Authors, Journal, Issue (Year) page
- [4] Authors, Journal, Issue (Year) page