

# Chemical vapour deposited h-BN: how far are we from exfoliated quality?

Yue Yuan<sup>1</sup>

Chao Wen<sup>2</sup>, Fei Hui<sup>3</sup>, Wenwen Zheng<sup>2</sup>, Xu Jing<sup>2</sup>, and Mario Lanza<sup>1\*</sup>

<sup>1</sup>Physical Sciences and Engineering Division, King Abdullah University of Science and Technology, Thuwal 23955, Saudi Arabia; <sup>2</sup>Institute of Functional Nano & Soft Materials, Collaborative Innovation Center of Suzhou Nano Science and Technology, Soochow University, Suzhou 215123, China; <sup>3</sup>School of Materials Science and Engineering, Zhengzhou University, Zhengzhou 450001, China

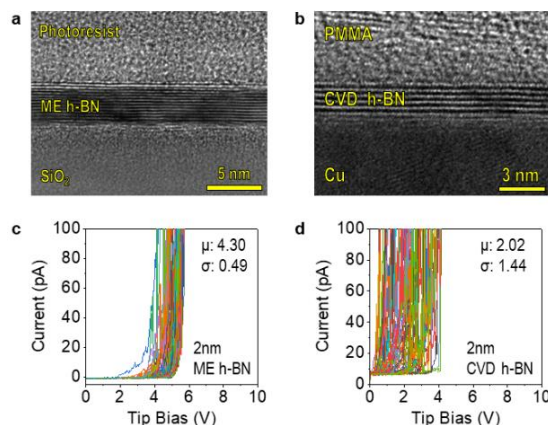
[mario.lanza@kaust.edu.sa](mailto:mario.lanza@kaust.edu.sa)

Recently, h-BN is commonly used as a dielectric material, and research in this area is still in its early stages. The reason for using h-BN as new dielectric material is that layered dielectrics (LD) like h-BN show ideal van der Waals interactions with graphene and 2D materials. In addition, h-BN exhibits very high dielectric strength and reliability when exposed to electric fields for long periods [1-7]. In this work, the morphological characterizations and electrical properties of mechanically exfoliated h-BN and chemical vapour deposited (CVD) h-BN have been quantitatively analysed and compared. For samples prepared by each method (mechanical exfoliated and CVD), multiple samples (different thicknesses, different fabrication conditions) were used and the same experiment was performed on these samples separately. In the final comparison, h-BN with the same thickness from two different preparation methods (exfoliated and CVD) were selected as representative comparison samples. By analysing the characteristics of the h-BN samples, we find that h-BN prepared by the CVD method has worse continuity and has fewer layer structures (more defects) due to its polycrystalline nature, compared to the exfoliated one (same thickness). Moreover, in nanoelectronic measurements collected with a conductive atomic force microscope working in a vacuum, mechanically exfoliated h-BN showed better electrical homogeneity, and presented a later dielectric breakdown, compared to the h-BN sample fabricated by the CVD method.

## References

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## Figures



**Figure 1:** Morphological characterizations and electrical homogeneity analysis of (a,c) mechanically exfoliated and (b,d) CVD-grown h-BN.