# Water-based 2D Material Inks enabled by Supramolecular Chemistry: from Printed electronics to Biomedical Applications

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Solution processing of 2D materials allows simple and low-cost techniques, such as ink-jet printing, to be used for fabrication of heterostructure-based devices of arbitrary complexity [1]. Our group has developed a supramolecular-based approach able to provide highly concentrated, defect-free, printable and water-based 2D crystal inks [2-3]. We have demonstrated several devices, such as printed photodetectors [2], capacitors [4], transistors [4-6] and fully printed memristors on flexible and rigid substrates [7].

In this talk I will show that the supramolecular approach can be exploited to tune the nanosheets surface chemistry by enabling their use in sensing. In particular, we have demonstrated a wearable breathing sensor, based on a water-based h-BN ink, which can precisely track even the slightest changes in the exhaling and inhaling breathing processes, without issues of cross-sensitivity and hysteresis [8]. Finally, we exploited our supramolecular approach to tune the surface charge of graphene, enabling production of amphoteric, cationic and anionic graphene [9-11]. Cytotoxicity tests confirm biocompatibility of the graphene inks, with cationic graphene having exceptional intracellular uptake profile as well as stability in the biological medium, making it very attractive for various applications in drug delivery and imaging [11].

## References

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[7] Peng et al, Mat. Horizon 2024, just accepted
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## Figures

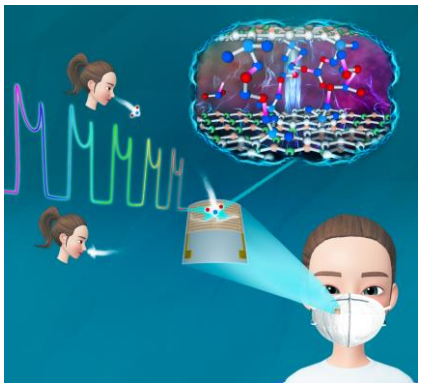

**Figure 1:** Schematic showing a wearable breathing sensor made with water-based h-BN inks.