

# Multi-responsive 2D materials : from multi-functional opto-electronic devices to multi-analyte sensors

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## Abstract

Two dimensional materials display exceptional physical and chemical properties which can be further enriched via controlled interfacing with (supra)molecular assemblies. Molecules, which can be designed and synthesized with properties at will, are able to impart them novel functions to 2D materials such as the capacity to respond to multiple external stimuli,[1] with the ultimate goal of generating multifunctional hybrid systems for applications in (opto)electronics, sensing and energy.

In my lecture, I will review our recent findings on the functionalization of 2D materials to engineer artificial responsive hetero-structures and memory devices[2,3] as well as hybrid assemblies that can operate as selective chemical sensors for small molecules and ions [4]. Finally, I will describe the fabrication of highly sensitive pressure and strain sensors for health monitoring [5].

Our modular strategies relying on the combination of 2D material with molecules offer a simple route to generate multifunctional 2D materials-based coatings, foams and nanocomposites with pre-programmed properties to address key global challenges in electronics, sensing and energy applications.

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## References

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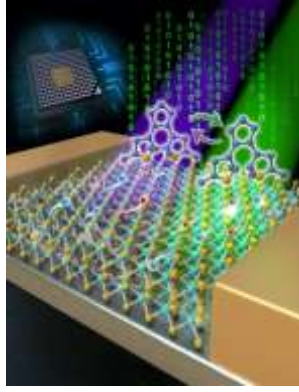
[4] Review of chemical sensing with 2D materials: C. Anichini, et al. *Chem. Soc. Rev.* 2018, 47, 4860-4908.

[5] Pressure sensor based on 2D materials + molecules: C.-B. Huang, et al., *Adv. Mater.* 2019, 31, 1804600.

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## Figures

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**Figure 1:** Optically switchable multilevel high-mobility FETs based on few-layer ambipolar WSe<sub>2</sub>.