
Collaborative Research Centre 1415 “Chemistry of Synthetic Two-Dimensional Materials”

CRC Seminar Series

DATE: 03 December 2020
TIME: 3:00 PM – 5:00 PM
LOC: Online Zoom Meeting

**GUEST SPEAKER:****Professor Paolo Samorì**

ISIS, Université de Strasbourg & CNRS, France

TITLE:**“2D materials based multi-responsive hybrids: from multi-functional opto-electronic devices to multi-analyte sensors”****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.

Reference

[1] Reviews on 2D materials + molecules for opto-electronics: (i) M. Gobbi, E. Orgiu, P. Samorì, *Adv. Mater.* 2018, 30, 1706103. (ii) S. Bertolazzi, M. Gobbi, Y. Zhao, C. Backes, P. Samorì, *Chem. Soc. Rev.* 2018 47, 6845-6888. (iii) Y. Zhao, S. Ippolito, P. Samorì, *Adv. Opt. Mater.*, 2019, 7, 1900286.

[2] Combination of 2D materials + molecules for controlled doping : (i) Y. Wang, et al., *Adv. Funct. Mater.* 2020 in press. (ii) Y. Wang, et al., *Small* 2019, 15, 1903432. (iii) M.-A. Stoeckel, et al. *ACS Nano* 2019, 13, 11613–11622.

[3] Combination of 2D materials + molecular switches for fabrication of multi-responsive electronic devices : (i) M. Gobbi, et al. *Nat. Commun.* 2018, 9, 2661. (ii) Y. Zhao, S. Bertolazzi, P. Samorì, *ACS Nano*, 2019, 13, 4814–4825. (iii) H. Qiu, et al., *Adv. Mater.* 2019, 31, 1903402. (iv) H. Qiu, et al., *Adv. Mater.* 2020, 32, 1907903. (v) Y. Zhao, S. Bertolazzi, M. S. Maglione, C. Rovira, M. Mas-Torrent, P. Samorì, *Adv. Mater.* 2020, 32, 2000740.

[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.

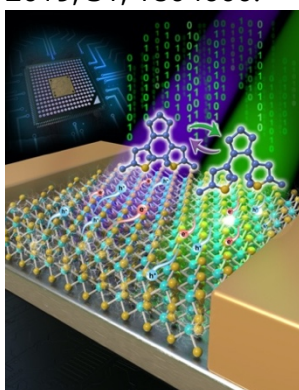


Figure 1: Optically switchable multilevel high-mobility FETs based on few-layer ambipolar WSe₂.

PROFILE OF PROFESSOR PAOLO SAMORÌ:

Paolo Samorì is Distinguished Professor at the Université de Strasbourg, Director of the Institut de Science et d'Ingénierie Supramoléculaires (ISIS) and Director of the Nanochemistry Laboratory. He is also Foreign Member of the Royal Flemish Academy of Belgium for Science and the Arts (KVAB), Fellow of the Royal Society of Chemistry (FRSC), Fellow of the European Academy of Sciences (EURASC), Member of the Academia Europaea and Senior Member of the Institut Universitaire de France (IUF). He obtained a Laurea (master's degree) in Industrial Chemistry at University of Bologna in 1995. In 2000, he received his PhD in Chemistry from the Humboldt University of Berlin.

He was permanent research scientist at the Consiglio Nazionale delle Ricerche of Bologna from 2001 to 2008 and Visiting Professor at ISIS from 2003 to 2008. He has published >350 papers on nanochemistry, supramolecular sciences, materials chemistry, and scanning probe microscopies with a specific focus on graphene and other 2D materials as well as functional organic/polymeric and hybrid nanomaterials for application in optoelectronics, energy and sensing. His work has been awarded various prizes, including the E-MRS Young Scientist Award (1998), the MRS Young Scientist Award (2000), the IUPAC Prize for Young Chemists (2001), the ERC Starting Grant (2010), the CNRS Silver Medal (2012), the Spanish-French "Catalán-Sabatier" Prize (2017), the German-French "Georg Wittig - Victor Grignard" Prize (2017), the RSC Surfaces and Interfaces Award (2018), the Blaise Pascal Medal in Materials Science of EURASC (2018), the Pierre Süe Prize of the French Chemical Society (2018), the ERC Advanced Grant (2019), "Les Étoiles de l'Europe" award - French Ministry of Higher Education, Research and Innovation (2019) and the Royal Society of Chemistry-Société Chimique de France Lectureship in Chemical Sciences (2020). He is Associate Editor of *Nanoscale* and *Nanoscale Advances* (RSC) and Member of the Advisory Boards of *Advanced Materials*, *Small*, *Smart Mat*, *ChemPhysChem*, *ChemNanoMat*, *ChemPlusChem* and *ChemSystemsChem* (Wiley-VCH), *Chemical Society Reviews*, *Chemical Communications*, *Nanoscale Horizons*, *Materials Advances* and *Journal of Materials Chemistry* (RSC), *ACS Nano* and *ACS Omega* (ACS).