Semiconductor Nanostructure Systems and Devices:

II. Nanodevice Iontronics: Combining Soft- and Condensed-Matter in Electric Double Layer Transistors.

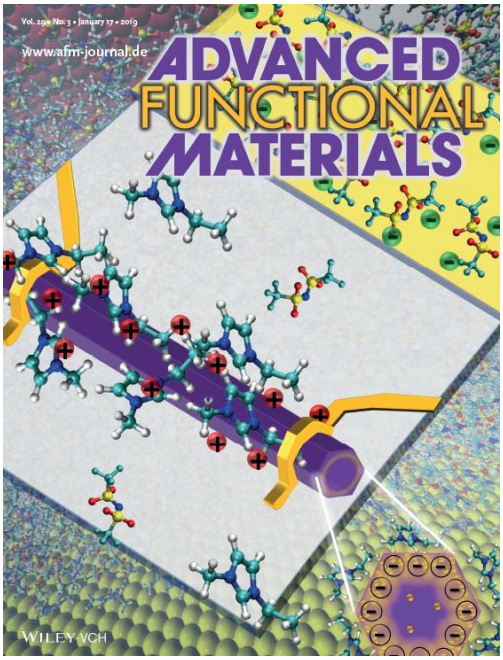
*This research line has a strong interdisciplinary character. It aims at exploiting the motion and arrangement of ions to control nanoelectronic devices, by using the field effect enabled by Electric Double Layers (**EDL**) that build up at the interface between nanostructures and ionic environments.*

- Design and fabrication of hybrid nanoelectronic devices, combining individual semiconductor nanostructures and soft-matter electrolyte gating media e.g. polymers, gels or ionic liquids.
  Nanostructures: Nanowires (in collaboration with Prof. Lucia Sorba); 2D materials (graphene, 2TMDs in collaboration with Camilla Coletti); Black-phosphorus (in collaboration with Prof. Stefan Heun).
  Electrolytes: Polymers and gels (in collaboration with Prof. Dario Pisignano); Ionic liquids (in collaboration with Prof. Lorenzo Guazzelli).

- Transport experiments with electrolyte-gated semiconductor nanostructure-based field effect transistors, also at low temperature, also in magnetic field.

Main topics of investigation include, but are not limited to:

1) Thermal/electrical transport in hybrid polymer-semiconductor systems: towards the nanoscale thermal transistor.
2) Thermal gating of semiconductor nanodevices using polymers enriched with mobile ions.
3) Calorimetric/dielectric techniques applied to the study of electrolytes used in **EDL** nanodevices.
4) Hybrid polymer-semiconductor metamaterials: photonic platforms for machine learning.
5) Surface acoustic wave-driven nanowire **EDL** transistors. (Collaboration: Prof. Marco Cecchini)
6) Quantum transport in **EDL** nanodevices.
7) Magnetic functionalization and electrostatic control in electronic nanodevices.
8) Nanoscale sensors and transductors enabled by **EDLs**.
9) Impact of electrode geometry in **EDL** transistors controlled by electrolytes.
10) Printable polymeric gates to control nanoscale **EDL** transistors.



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