9th International Conference on Molecular Electronics
Paris, France
August 27-31st 2018

Hybrid (spin)interface between a 2D material and a metal

Johann Coraux

[a]*Univ. Grenoble Alpes, CNRS, Grenoble INP, Institut NEEL, 38000 Grenoble, France. Email: johann.coraux@neel.cnrs.fr*

Abstract:

Interfaces between molecules and inorganic materials, *e.g.* metals, are at the heart of molecular electronics, optoelectronics or spintronics. They sometimes even dominate the behaviour of devices, and for this reason are fields of investigation in their own right — spinterface being a striking illustration. Seeing two-dimensional materials (graphene, boron nitride or transition metal dichalcogenides, etc) as molecules may seem far-fetched. I wish to discuss the idea that just like molecules they form hybrid interfaces with metals, though. And in fact these interfaces share interesting similitudes with molecule/metal interfaces, but come together with original features. Graphene, as the first studied two-dimensional material, has been scrutinised by us and others, to try to answer several key questions in this respect: What is the physico-chemistry, noteworthy the nature of bonding, at the graphene/metal interface? What is special with having a highly cohesive material instead of molecules in contact with the metal surface? How can we prepare and control interfaces with (functional) metals at will? Answering these questions opens opportunities: Graphene (or molecules) may serve as a building-block in magnetic multilayers to be used in carbon-inside spintronic devices; Highly transparent graphene-superconductor junctions may be created and superconductivity induced in graphene; Other two-dimensional materials may be used instead of graphene, to seek for more advanced interfacial phenomena in the future.

References:

J. Coraux *et al.* Nano Lett. 8, 564 (2008)
I. Pletikosić *et al.* Phys. Rev. Lett. 102, 056808 (2009)
C. Busse *et al.* Phys. Rev. Lett. 107, 036101 (2011)
N. Rougemaille *et al.* Appl. Phys. Lett. 102, 142403 (2012)
J. Coraux *et al.* Acc. Chem. Res. 46, 2193 (2012)
C. Tonnoir *et al.* Phys. Rev. Lett. 111, 246805 (2013)
S. Vlaic *et al.* Appl. Phys. Lett. 104, 101602 (2014)
H. Yang *et al.* Nano Lett. 16, 145 (2016)
A.-D. Vu *et al.* Sci. Rep. 6, 24783 (2016)
S. Vlaic *et al.* Phys. Rev. Mater. 1, 053406 (2017)
S. Vlaic *et al.* J. Phys. Chem. Lett. 9, 2523 (2018)