

Few-layer black phosphorus as novel support for metal nanoparticles

Maria Caporali,^a Manuel Serrano-Ruiz,^a Salvatore Interlandi,^a Andrea Ienco,^a Stefan Heun,^b Maurizio Peruzzini^a

^a CNR-ICCOM, Via Madonna del Piano 10, 50019 Sesto Fiorentino, Italy

^b NEST, Istituto Nanoscienze-CNR and Scuola Normale Superiore, Piazza S. Silvestro 12, 56127 Pisa, Italy.

Black phosphorus (BP) has a layered structure thus it can be exfoliated down to the monolayer. In our labs, good quality phosphorene flakes were prepared by sonicating BP in dimethylsulfoxide.¹ Afterwards transition metals nanoparticles of nickel, ruthenium, palladium and gold have been immobilized on it. The resulting nanocomposites were characterized by TEM, AFM and XPS. As preliminary application, Ni-2D BP composite was tested in the hydrogenation of phenylacetylene and exhibited high catalytic activity and selectivity towards styrene. The applications of Ru-2D BP, Pd-2D BP and Au-2D BP in several catalytic reactions is in progress and their electronic properties will be studied as well and compared with that of pristine phosphorene.

¹ M. Serrano-Ruiz, M. Caporali, A. Ienco, V. Piazza, S. Heun, M. Peruzzini, *Adv. Mater. Interfaces*, **2015**, doi: 10.1002/admi.201500441.