

Palladium/Black Phosphorus Nanohybrid: Unraveling the Nature of Pd-P Interaction and Application in Catalysis

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Among the family of bidimensional materials, exfoliated black phosphorus, 2D bP, came out as a hot and intriguing topic over the last few years.[1, 2] The sp³ hybridization and the formal presence of a lone pair on each phosphorus atom offers the potential to get involved in strong interactions with metal fragments. We report here the preparation of a palladium/black phosphorus nanohybrid (Pd/bP) by in situ growth of Pd nanoparticles on bP nanosheets. Extensive characterization of the material highlighted the nature of the Pd-P interaction. An X-ray Absorption Spectroscopy (XAS) study carried out at the Pd-K edge reveals the presence of both Pd-Pd and Pd-P bonds. Considered the high fraction of Pd atoms on the nanoparticles surface this finding evidences the interaction between Pd and bP nanosheets. As a survey of its potential application, the material has been tested as catalyst in the selective hydrogenation of chloronitrobenzene to chloroaniline, which results in a much higher selectivity in comparison to other Pd-based catalysts. **Acknowledgements** This work was supported by an ERC Advanced Grant PHOSFUN "Phosphorene functionalization: a new platform for advanced multifunctional materials" (Grant Agreement No. 670173) to M. P., and project Beyond-Nano (PON a3_00363) CNR-IMM. _____ [1] Pumera M., Sofer Z., Gusmão R., *Angew.Chem. Int. Ed.* 2017, 56, 8052–8072. [2] Peruzzini M. et al., *Eur. J. Inorg. Chem.*, DOI: 10.1002/ejic.201801219.

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