

Prospects for Hydrogen Storage in Graphene

Stefan Heun

NEST, Istituto Nanoscienze-CNR and Scuola Normale Superiore, 56127 Pisa, Italy

The realization of innovative hydrogen storage materials has worldwide strategic importance. Graphene has recently attracted attention as a promising hydrogen storage medium. Indeed, graphene is lightweight, chemically stable, and exhibits attractive physical–chemical properties for hydrogen adsorption. Furthermore, the interaction between hydrogen and graphene can be controlled by functionalization.

In my seminar I will discuss various aspects of the interactions between hydrogen and graphene, like chemisorption, physisorption, and a combination of both, via the hydrogen spillover effect [1]. Then I will discuss the extension of these concepts to a new material, the three-dimensional arrangement of epitaxial graphene conformally grown on porousified crystalline SiC [2,3], that we have recently developed in collaboration with the group of U. Schmid from the TU Wien.

- [1] J.-W. Chen, S.-H. Hsieh, S.-S. Wong, Y.-C. Chiu, H.-W. Shiu, C.-H. Wang, Y.-W. Yang, Y.-J. Hsu, D. Convertino, C. Coletti, S. Heun, C.-H. Chen, and C.-L. Wu: *Hydrogen spillover and storage on graphene with single-site Ti catalyst*, ACS Energy Lett. 7 (2022) 2297 – 2303.
- [2] S. Veronesi, G. Pfusterschmied, F. Fabbri, M. Leitgeb, O. Arif, D. A. Esteban, S. Bals, U. Schmidt, S. Heun: *3D arrangement of epitaxial graphene conformally grown on porousified crystalline SiC*, Carbon 189 (2022) 210 – 218.
- [3] A. Macili, Y. Vlamidis, G. Pfusterschmied, M. Leitgeb, U. Schmid, S. Heun, and S. Veronesi: *Study of hydrogen absorption in a novel three-dimensional graphene structure: towards hydrogen storage applications*, Appl. Surf. Sci. 615 (2023) 156375.