2D crystals-based next-generation energy devices

Francesco Bonaccorso[1,2]

1 Bedimensional S.p.A., Lungotorrente secca 30R, 16163 Genova, Italy.
2 Istituto Italiano di Tecnologia, Graphene Labs, Via Morego 30, 16163 Genova, Italy.

f.bonaccorso@bedimensional.it

We will present our latest progresses on the production of 2D materials[1-3] and their industrial scaling up. Defining scalable, reliable, and inexpensive production processes is a must for the extensive use of 2D materials in various applications,[4-14] involving a balance between final product quality and ease of fabrication. We will show the efficiency of the manufacturing of high-quality 2D materials by wet-jet milling[3] and the path towards industrial production.
Afterward, we will provide an overview on selected key applications of the as produced 2D materials, with focus on energy. We will show how the production of 2D materials in liquid phase by wet-jet milling[3] represents a powerful pathway towards the development of 2D materials-based energy devices, offering massive integration flexibility compared to other production methods. We will present insights in areas such as energy conversion[6-11] and storage[12,13] application, and anticorrosion coatings.[14]

References

[1] F. Bonaccorso, *et. al*., ***Adv. Mater***. 28, (2016), 6136.
[2] F. Bonaccorso, *et al*., ***Materials Today***, 15, (2012), 564.
[3] A. E. Del Rio Castillo *et. al*., ***Mater. Horiz***. 5, (2018), 890.
[4] F. Bonaccorso, *et al*., ***Nature Photonics***, 4 (2010), 611.
[5] G. Iannaccone, F. Bonaccorso *et al*., ***Nature Nanotech*** 13, (2018), 183.
[6] F. Bonaccorso, *et. al*., ***Science***, 347, (2015), 1246501.
[7] L. Najafi *et al*., ***ACS Nano*** 12, (2018), 10736.
[8] P. Mariani, *et al*., ***Nature Comm***. 15, (2024), 4552.
[9] L. Najafi *et al*., ***Adv. Ener. Mater***. 8, 1703212 (2018).
[10] E. Lamanna *et al*., ***Joule*** 4, 865-881 (2020).
[11] S. Pescetelli *et al*., ***Nature Energy*** 7, (2022), 597-607.
[12] E. Pomerantseva, F. Bonaccorso *et al*., ***Science*** 366, (2019), eaan8285.
[13] M. Garakani, *et al*., ***Energy Storage Materials*** *34,* (2020), *1-11*.
[14] M. A. Molina-Garcia, *et al.,* ***J. Phys. Mater****. 6*, (2023), 035006.

This project received founding from the European Union's GREENCAP Horizon Europe research and innovation program under Grant Agreement No.101091572 and 2D-PRINTABLE Horizon Europe research and innovation program under Grant Agreement No.694101.