The path toward mass production of high quality 2D materials

Francesco Bonaccorso[1,2]
[1] BeDimensional S.p.A. via Lungotorrente Secca 30R, 16163 Genoa, Italy
[2] Graphene Labs, Istituto Italiano di Tecnologia, via Morego 30, 16163 Genoa, Italy
f.bonaccorso@bedimensional.it

We will provide an overview on the BeDimensional strategy in the development of industrial-scale, reliable, inexpensive production processes of graphene and related two-dimensional materials (GRMs).[1-3] This is a key requirement for their widespread use in several application areas,[1-8] providing a balance between ease of fabrication and final product quality. We will show the effectiveness of the production of GRMs by wet-jet milling [3] and the route towards future Industrial scale up, maintaining the high-quality production ruled by the ISO standard.
Afterward, we will focus on some key applications of the as-produced GRMs, with particular emphasis on the energy sector. In this context, the production of GRMs in liquid phase by wet-jet milling [2,3] represents a simple and cost-effective pathway towards the development of GRMs-based energy devices, presenting huge integration flexibility compared to other production methods. We will provide an insight into some application areas such as anticorrosion coatings and energy conversion and storage devices. [4-12]

References

[1] F. Bonaccorso, et. al., *Adv. Mater*. 28, 6136-6166 (2016).
[2] F. Bonaccorso, et al., *Materials Today*, 15, 564-589, (2012).
[3] A. E. Del Rio Castillo et. al., *Mater. Horiz*. 5, 890 (2018).
[4] E. Pomerantseva, F. Bonaccorso, et al., *Science* 366 (6468) eaan8285 (2019).
[5] F. Bonaccorso, et. al., *Science*, 347, 1246501 (2015).
[6] L. Najafi et al., *Advanced Energy Materials* 8 (16), 1703212 (2018).
[7] E. Lamanna et al., *Joule* 4, 865-881 (2020).
[8] S. Bellani, et al., *Chem. Soc. Rev*. 50, 11870-11965 (2021).
[9] M. Garakani, et al. *Energy Storage Materials 34, 1-11* (2020).
[10] S. Bellani, et al. *Nano Lett*. 18, 7155-7164 (2018).
[11] A. E. Del Rio Castillo, et al., Chem. Mater. 30, 506-516 (2018).
[12] S. Pescetelli et al., Nature Energy 7, 597-607 (2022).

"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement GrapheneCore3 - 881603"