Liquid phase production of 2D crystals for energy applications

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Abstract

Graphene and related two-dimensional materials (GRMs) are entering several application areas, [1-5] improving the performance of existing devices or enable new ones. [1-5] A key requirement for the implementation of GRMs in the energy field is the development of industrial-scale, reliable, inexpensive production processes, [2] while providing a balance between ease of fabrication and final product quality.
In this context, the production of GRMs in liquid phase [2,6] represents a simple and cost-effective pathway towards the development of GRMs-based energy devices, presenting huge integration flexibility compared to other production methods. Here, I will first present our strategy to produce GRMs on large scale by wet-jet milling [7] of their bulk counterpart and then an overview of their applications for energy conversion and storage devices. [3,8-18]

REFERENCES

[1] A. C. Ferrari, F. Bonaccorso, *et al.*, *Nanoscale*, 7, 4598-4810 (2015).
[2] F. Bonaccorso, et al., *Materials Today*, 15, 564-589, (2012).
[3] F. Bonaccorso, et. al., *Nature Photonics* 4, 611-622, (2010).
[4] E. Pomerantseva, et al., *Science* 366 (6468) eaan8285 (2019).
[5] G. Iannaccone, et al., *Nature Nanotech* 13, 183, (2018).
[6] F. Bonaccorso, et. al., *Adv. Mater*. 28, 6136-6166 (2016).
[7] A. E. Del Rio Castillo et. al., *Mater. Horiz*. 5, 890 (2018).
[8] F. Bonaccorso, et. al., *Science*, 347, 1246501 (2015).
[9] J. Hassoun, et al. *Nano Lett*. 14, 4901-4906 (2014).
[10] H. Sun, et al. *2D Materials* 5, 01502 (2018).
[11] G. Longoni, et al. *Nano Energy* 51, 656-667 (2018).
[12] S. Bellani, et al. *Nano Lett*. 18, 7155-7164 (2018).
[13] V. Romano, et al. *ChemPlusChem* 84, 882-892 (2019).
[14] A. E. Del Rio Castillo, et al., Chem. Mater. 30, 506-516 (2018).
[15] S. Bellani, et al. *Nanoscale Horizons* 4, 1077 (2019).
[16] S. Bellani, et al. *Adv. Funct. Mater*. 29, 1807659 (2019).
[17] L. Najafi et al., *Advanced Energy Materials* 8 (16), 1703212 (2018).
[18] G. Kakavelakis et al., *ACS nano* 11, 3517-3531 (2017).