2D crystals-based energy devices

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Graphene and other bi-dimensional (2D) crystals, thanks to their excellent and complementary properties, are emerging as promising materials to boost the performances of energy devices.[1-6] However, a key requirement for the widespread applications of 2D crystals in the field of energy storage and conversion devices relies in the development of industrially scalable, reliable, inexpensive production processes.[7,8] Here, a balance between ease of fabrication and material quality with on-demand properties is a must.
In this context, liquid-phase exfoliation of bulk layered materials[7-10] is offering a simple and cost-effective pathway to fabricate various 2D crystal-based energy devices,[1-6,11-15] presenting huge integration flexibility compared to conventional methods.
Here, I will show our scaling up approach for the solution processing of 2D crystal based on wet-jet milling of layered materials. Moreover, I will present an overview of 2D crystals for energy conversion[5,6,11-14] and storage[3,4,15] applications from the fabrication of large area electrodes[2,13,14] to devices integration. Finally, I will discuss the main hurdles toward the commercialization of 2D-crystals-based energy devices.

References

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Figures

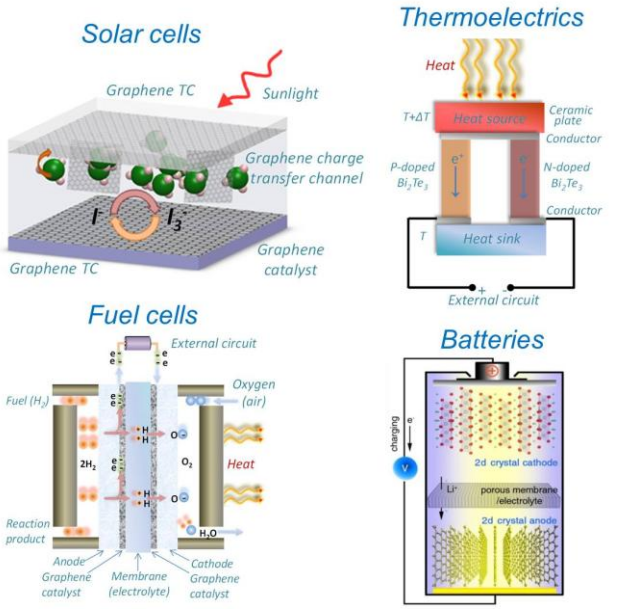

Figure 1: Energy conversion devices based on 2D crystals. Schematic of a dye-sensitized solar cell; Thermoelectric device; Proton exchange membrane fuel cells and Li-ion battery.