Large and pure h-BN nanosheets obtained by a unique combination of PDCs route with SPS process

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Abstract

Since graphene's properties are strongly linked to the substrate on which it is deposited, it is clear that the promising future development of practical graphene devices will necessarily go through the development of insulating substrates on which graphene can be deposited without changing its intrinsic properties. One of the most suitable substrates appears to be the hexagonal variety of boron nitride (h-BN, also called “white graphite”), which is isostructural and isoelectronic of graphene, with a lattice matching that of graphene. As a consequence, the development of a novel source for highly crystallized h-BN crystals, suitable for a further exfoliation, is a prime scientific issue. This presentation proposes a promising approach to synthesize pure and well-crystallized h-BN flakes, which can be easily exfoliated into Boron Nitride NanoSheets (BNNSs). This new accessible production process represents a relevant alternative source of supply in response to the increasing need of high quality BNNSs. The synthesis strategy to prepare pure h-BN is based on a unique combination of the Polymer Derived Ceramics (PDCs) route [1] with the Spark Plasma Sintering (SPS) process [2]. Through a multi-scale chemical and structural investigation, it is clearly shown that obtained flakes are large (fig.1), defect-free and well-crystallized, which are key-characteristics for a subsequent exfoliation into relevant BNNSs.

References

[1] S. Yuan, B. Toury, C. Journet, A. Brioude, Nanoscale, **6** (2014) 7838.
[2] S. Yuan, S. Linas, C. Journet, P. Steyer, V.Garnier, G. Bonnefont, A. Brioude, B. Toury, Scientific Reports, **6** (2016) 20388.

Figures

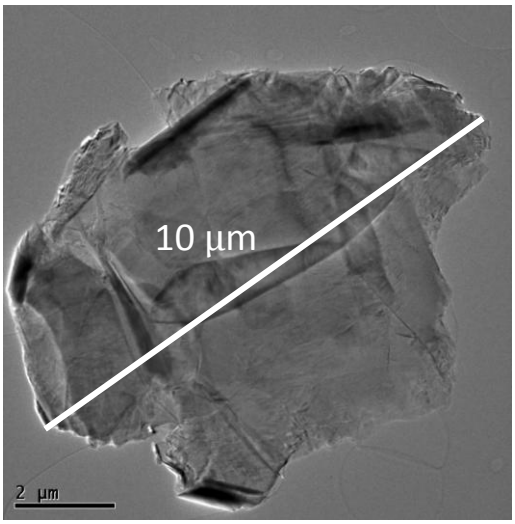

Figure 1: TEM bright field micrograph attesting the large dimension of h-BN flake resulting from the PDCs/SPS dual process