Few-layered mesoporous graphene obtained through high energy dry ball-milling.

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Graphene-based materials (GBMs), such as graphene oxide (GO), few-layered graphene (FLG) or graphene nanoplatelets (GNPs), differ from graphene in physical and chemical properties and synthesis methods. Several techniques have been developed for a scalable and potential GBMs production since the yields obtained from the original tape method Is reduced and limited to lab use. Although these techniques present their corresponding benefits and drawbacks, none of them has yet accomplished the large-scale production requirements [1].
In this work, we used a high energy dry ball-milling method to obtain few-layered mesoporous graphene (FLMG). We tested different milling conditions and times ranging from 20 to 300 minutes. FLMG was studied using XRD, SEM, TEM, UV-vis absorption and confocal Raman spectroscopy. The characterization revealed homogeneous nanoparticle size distributions with non-oxidized aggregations of few-layered graphene domains (for example, a mean value of 132(2) is obtained for the 100 min. sample). This top-down technique uses no additives or post-treatments, unlike wet ball-milling, making it low-cost, environmental-friendly, and suitable for large-scale production. The FLMG obtained by this method demonstrated an excellent performance as NO2 sensing material [2]. Further applications such as electromagnetic shielding and polymer-based composite materials are worth exploring [3, 4].

REFERENCES

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FIGURES

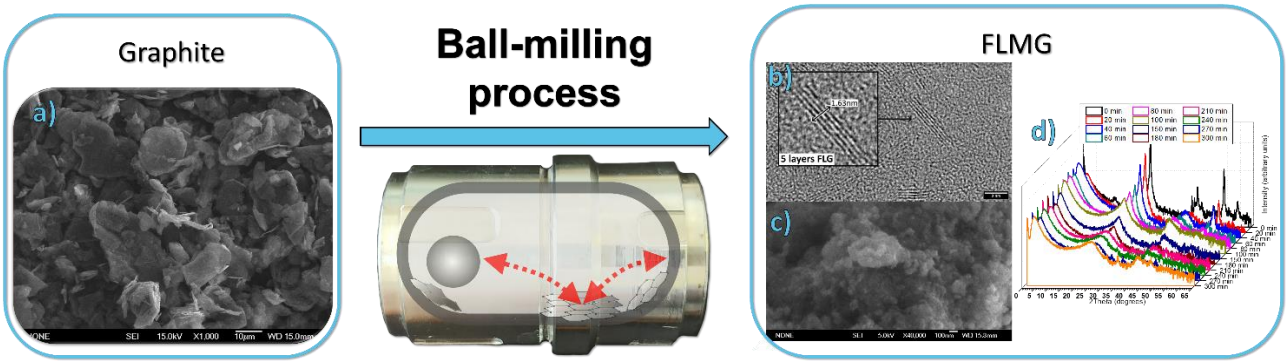

Figure 1: Representation of the ball-milling process including a) SEM image of the precursor, b) TEM and c) SEM images of the material obtained after 240 min of milling and d) XRD spectra showing the evolution of the materials crystallography with the milling time.