Nano-Carbons: Synthesis and potential impact on the environment

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The increase in carbon nanotubes (CNTs) production (estimated to reach 14000 tons in 2016) and more recently graphene and related materials (GRMs) is driven by many applications – some of which being already on the market (paints and composites for example). In parallel, questions are also raising about their safe handling and use (mainly for workers, including researchers), but also about their end of life in the environment. The CIRIMAT is focusing for more than 10 years on the CCVD synthesis of double-walled CNTs (DWNTs) [1] because they represent unique objects at the interface between single-wall CNTs (SWNTs) and larger multi-walled CNTs (MWNTs). The protection offered by the outer tube allows to modify the interface with the environment (solvent, matrix, etc.) while minimizing interferences with the inner one, and keeping a morphology close to that of SWNTs. We have also developed a synthesis of few-layer graphene (FLG) by sonication-assisted exfoliation of graphite [2]. Finally, we are also reducing graphene oxide in order to prepare a range of nanocarbons with similar morphology but a different surface chemistry.

After describing briefly the synthesis of the different nanocarbons, we will summarise and compare the results obtained in terms of ecotoxicity of nanocarbons on different models (amphibians [3-5], algae [6, 7], etc.). We will discuss some issues about the influence of sample processing and exposure protocols as well as of the metrics for the comparison of the results [8, 9].

References

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