A PROACTIVE APPROACH FOR THE SAFE AND RESPONSIBLE PRODUCTION OF GRAPHENE-BASED NANOPLATELETS

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Among the different types of novel materials discovered at nanoscale, recently graphene is offering tremendous potential in the field of (opto)electronics and photonics due to its outstanding properties[1]. However, uncertainties related to the safety of these material and related technologies have created a major obstacle for industry[2].

This work gives a first approach in risk analysis to identify and control potential risks related to the up-scaling of graphene nanoplatelets (patent WO 2016/042305 A1)[3] and graphene-based ink manufacturing processes developed within the H2020 Project INSPIRED[4].

The proposed strategy includes **(i)** qualitative hazard evaluation (i.e.; review of existing (eco)toxicological data, preparation of a questionnaire in order to create a general overview of important nanosafety related issues, on-site company visits) and **(ii)** the use of qualitative and semi-quantitative tools for risk assessment (ISO-CB 12901[5], Stoffenmanager Nano[6] , ECETOC TRA[7]).

Following this concept, detailed process descriptions/work flows were defined and risk profiles associated with initial exposure estimates were created, taking into account existing safety measures. We found that the level of occupational exposure and also environmental risks are minimized because tasks are performed under inherently safe conditions (e.g., synthesis processes are always processed in a wet (aqueous) phase thus minimizing airborne exposure, by-products are recycled/reused for further synthesis).

In addition, previous exposure monitoring at laboratory scale indicated no graphene release into the workplace environment. However, further exposure assessment of the pilot plant, including up-scaled processes for bulk production of graphene and ink formulation is planned.

To conclude, this study provides an overview of the safety measures that must be employed to ensure and/or enhance the safety levels during the production of graphene-nanoplatelets. Also, two additional benefits from employing these safety measures could be the potential for easier process scale-ups and reduced time-to market.

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