

Task Group 2 Charge

MWCNT Material information

The charge for Task Group 2 consists of identifying the factors that influence the selection and use of MWCNTs - polymer combinations in commercial use with respect to how those factors may affect 1) release of MWCNTs from the products/articles and 2) release measurement methods evaluation.

The material under study will change over its expected lifecycle. For example, a polymer - MWCNT composite will undergo conformational changes depending on the rigidity/flexibility of the polymer matrix, degree of cross-link, degradation, expansion, contraction, etc. Further, information on material use and end-of-life behavior will help identify realistic release scenarios for the material in this project. To distinguish between the situation where the MWCNT is intrinsically migrating or the polymer characteristics are such that nanoparticle release is favorable, it is felt that the following questions will be helpful to understand the potential for release, and design a realistic and appropriate methods to evaluate release scenarios.

Basic Material Chemistry (within the scope of what is currently being used in articles in commerce)

- What is the chemistry behind the matrix material building blocks (monomers, molecular weight, impurities, rigidity/flexibility/swellability, viscosity, chemical stability, drying time, etc)
- What are the properties that most dramatically influence the stability of these materials- how they are cured, degradation of the materials via UV, abrasion, oxidation, other
- Are there multiple product lines of the same material which differ significantly in performance – if so, should we be considering different product lines as a comprehensive study of the material
- Is the material designed to be stable over its lifecycle, or is the intent to release nanoparticles? If stable, what is the maximum percentage allowable in the matrix for optimum performance
- What is the chemistry behind the interaction between the matrix and the nanoparticle (electrostatic, covalent, ionic) and how does it vary under different stresses in the normal use-pattern lifecycle
- What is the purpose of adding nanoparticulates, e.g., increase strength, Young's modulus, etc.

Matrix Material Use

- What are the uses for these materials (what products and applications are they used in)
- Do these applications products rely on these materials alone or are other materials used to add stability, functionality (i.e. is there another coating typically used for some applications)

- Is this material a good surrogate or indicator of what is found on the market

Matrix material end of life

- What is the lifecycle for the matrix material (disposed of in landfill, recycled...etc)
- If recycled- what is the process for recovery
- If disposed in a landfill- what is the fate of the matrix material including its degradation time and degradation products
- What is the expected environment fate of this substance