Background of the ANSI-NSP

In 2004, at the request of then OSTP-Director Dr. John Marburger, ANSI established its Nanotechnology Standards Panel (ANSI-NSP), to coordinate the development of standards, including nanotechnology terminology nomenclature, to be utilized by academics, industry, investment communities and Government. The ANSI-NSP serves as the cross-sector coordinating body for the purposes of facilitating the development of standards in the area of nanotechnology including, but not limited to, nomenclature/terminology; health, safety and environmental aspects; materials properties; and testing, measurement and characterization procedures.

The ANSI-NSP does not develop the standards themselves, but instead relies on relevant standards development organizations (SDOs) whose scopes of work may include nanomaterials and nanotechnology applications. As nanotechnology is a relatively new field, and as new materials and applications are still emerging, the ANSI-NSP holds meetings and workshops of impacted stakeholders to discuss standards needs for topics as they are identified.

Since its establishment, the ANSI-NSP has held workshops and meetings focused on the following topic areas: graphene, advanced materials, nanotechnology and regulation. Outcomes from these workshops include recommendations for the development of material-specific standards within the various nanotechnology standardization activities.

Why Nanoplastics?

Concerns have been raised about the potential impacts of nanoplastics on both human health and the environment. Nanoplastics can be directly released to the environment or secondarily derived from plastic disintegration in the environment[1]. Through disposal, there can be unintended releases of these degraded particles into the environment resulting in possible exposures to a variety of forms of life such as plants, aquatic and terrestrial animals and humans. There is growing pressure for governments and organizations to understand both nano- and micro- plastics pollution and how to mitigate negative impacts.

The ANSI-NSP convened this Workshop to:

- Share relevant information about nanoplastics, including an overview of activities both domestic and globally, and within governments and the private sector.
- Identify what consensus standards are needed and prioritize what can be developed now, versus those topics that require more research and data?

This document summarizes the highlights of the Workshop conclusions. Presentations given during the Workshop are available to the public here.

Workshop General Conclusions

While the workshop resulted in the identification of specific standards needs in the areas of measurement and health and environmental impact needs for nanoplastics, a number of high-level, general conclusions were made throughout the course of the two-day workshop. These conclusions include the following:

Standardization needs:

- The establishment of consistent terminology is necessary. Multiple definitions for nanoplastics are currently being utilized and there is confusion between what is a nanoplastic versus what is a nanopolymer. It will be important to identify a cut-off between what is a microplastic and what should be considered a nanoplastic.
- A significant challenge is the lack of sufficiently representative nanoplastic samples. The existing reference materials are not sufficient for considering the complexity of nanoplastics. Relevant reference materials are needed that mimic real-world scenarios.
- It would be beneficial to develop a risk management framework for nanoplastics that are material-specific. Decision trees could be developed for each material.

Engagement needs

- It will be useful to engage pre-standardization activities such as the Versailles Project on Advanced Materials and Standards (VAMAS). Many such activities are already considering nanoplastics.
- Coordination of efforts is necessary; not only amongst the various SDOs working in nanotechnology standardization, but also collaboration with governments and industry.
- There is a need to foster greater engagement with relevant industry and academic experts in this topic area.

Conclusions from the Workshop Breakout Sessions

The workshop held two breakout sessions to encourage more detailed discussions in two specific areas: Measurement and Characterization and Health and Environmental Impacts. A series of questions was posed to experts via Slido, the responses to which were used to facilitate more detailed conversations. The Slido questions and responses are attached as Annexes to this Report.

While there was no terminology-specific breakout held, questions regarding terminology related issues were woven throughout the two breakout discussions. Both breakout groups also identified concerns about sampling and separation of nanoplastics from composites and the need to consider those nanoplastic particles that function as carriers.

Measurement and characterization:

Charge to the Breakout Group:

Improve the shared understanding on measurement and characterization and identify how SDOs could initiate standards development activities

Conclusions from the Breakout Group:

- Everything about nanoplastics is a measurement challenge.
- The existing nanomaterials standards are not applicable for nanoplastics, as these documents are often material-specific and based on intentionally produced nanomaterials. While there are intentionally produced nanoplastics, most are by-products and/or the result of degradation. However, it may be possible to identify best practices from existing documents which can be translated for consideration for nanoplastics.
- Nanoplastic-specific standards are needed as soon as feasible (and based on the data received)
- It may be necessary to move from general standards (how to use specific techniques) to more fit-for-purpose documents.
- Standards needs include: Test materials, analytical methods, consistency in reporting results.
- Specific standardization topics identified are:
    - Material Specification focusing on properties that need to be measured from a mixture of incidental nanoplastics found in the environment, including:
        - Measurement method for composition/quantitative analysis – Pyrolysis GC-MS
        - Quantitation of nanoplastic populations using Pyrolysis GC-MS

Health and environmental impacts

Charge to the Breakout Group:

Consider whether nanoplastics are different from other nanomaterials and, if so, how? Are the existing standards and technical reports addressing nanomaterials applicable to EHS concerns for nanoplastics? If not, what is missing?

Conclusions from the Breakout Group:

- Terminology is necessary: different material sizes can infer different health effects. It will be important to delineate these materials based on size as well as their origin, and when they change from being plastic. It will be necessary to define all of these concepts.
- Needs relative to sampling/separation were identified, including: describing the chemistry, the route of exposure and identifying and isolating nanoplastics in different environmental matrices; identification of detection limits – for this it may be possible to rely on techniques established for other nanomaterials but they will need to be modified for nanoplastics.
- The most important matrices for Health and Environmental Impact studies at this time include:
    - Air, water, surface accumulation
    - Food stuffs and human samples (like urine)
    - Soil/sediment