

## Dragon, Karen E. (CDC/NIOSH/EID)

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**To:** NIOSH Docket Office (CDC)  
**Cc:** Chen, Jihong (Jane) (CDC/NIOSH/EID) (CTR)  
**Subject:** 161-A - Occupational Exposure to Carbon Nanotubes and Nanofibers Comments

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### Comments

Comments related to the NIOSH Current Intelligence Bulletin Occupational Exposure to Carbon Nanotubes (CNT) and Nanofibers (CNF)

1. The need of standards for nanomaterials is critical. NIOSH has made a bold attempt to propose health standards for CNT/CNF at a time when the toxicology data is limited and often based on a poor understanding of the tested materials. But it is counterproductive for NIOSH to propose a single mass-based REL for the heterogeneous group of CNT/CNF.
2. The proposed method (NIOSH 5040) is not specific to CNT/CNF. This method has distinct limitations and is not standard practice in most analytical laboratories. The EC/OC method has been used for many years in air quality speciation studies. However, it has also been the subject of debate. It should also be noted that in air quality studies, samples are typically collected for longer sampling periods (24-hours) and at higher flow rates (18 L/min).
3. Currently the majority of CNT/CNF work in the USA is related to short-term "task-based" (i.e., less than 8-hour). An 8-hour TWA will not be appropriate for short-term task-based work. NIOSH should provide guidance on a short-term exposure limit to address the way work is conducted in research and many production facilities.
4. NIOSH is recommending a REL of 7  $\mu\text{g}/\text{m}^3$  of elemental carbon (EC) as an 8-hr TWA respirable mass airborne concentration, and they state "excess risk of adverse lung effects is predicted below this level". However, NIOSH does not provide a basis for this statement. Furthermore, NIOSH does not state what part of the population the REL will protect. In general this is not the process that has been followed in protecting workers by standard setting. Standards or RELs are set to protect a known percentage of workers from a known hazard. NIOSH must provide better dose-response information.
5. NIOSH proposes a mass-based standard, but mass measurements for CNT/CNF may not correlate well with health outcomes. A mass-based standard might be appropriate for a single type of CNT/CNF, where mass has been related to particle surface area or particle counts, or where the material of interest can be related more closely to health outcomes

fitting a dose-response relationship. Health protection for fibrous materials has classically been done using the established counting methods.

6. NIOSH is vague in the ancillary testing that should be considered to better describe the CNT/CNF materials. NIOSH could help industry by providing a detailed flow diagram and logic decision tree (e.g., see draft NIOSH TiO<sub>2</sub> Guidance Document flow chart) to guide standardized test methods for ensuring that CNT/CNF is well described.

7. Where another country has already set a standard, NIOSH should address how the standard(s) should be compared with respect to the proposed NIOSH REL. The BSI standard is analogous to the asbestos standard (NIOSH has compared CNT/CNF to asbestos).

8. NIOSH has taken an extremely diverse group of materials and simplified a method for quantification of exposure that offers questionable protection and at the same time may be overly conservative for materials that are intentionally made safer (such as those intended for use in medical treatment.) This approach inhibits development of safer alternatives and removes one of the most useful control approaches of substitution.

9. There is sufficient knowledge to know that tubes without catalyst are of lesser cytotoxicity than those that are associated with cadmium, cobalt, nickel, etc. catalyst particles. NIOSH should use this knowledge to set more appropriate set of RELs for differing types of CNT/CNF.