



Standard Guide for Handling Unbound Engineered Nanoscale Particles in Occupational Settings¹

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INTRODUCTION

Nanometre-scale particles are encountered in nature and in industry in a variety of forms and materials. Engineered nanoscale particles as a class comprise a range of materials differing in shape, size, and chemical composition, and represent a broad range of physical and chemical properties. Workers within some nanotechnology-related industries and operations have the potential to be exposed to these engineered nanoscale particles at levels exceeding ambient nanoscale particle concentrations through inhalation, dermal contact and ingestion when not contained on or within a matrix (unbound). Occupational health risks associated with manufacturing, processing and handling unbound nanoscale particles, agglomerates or aggregates of nanoscale particles are not yet clearly understood. Dominant exposure routes, potential exposure levels and any material hazard are expected to vary widely among particular nanoscale particle materials and handling contexts. Additional research is needed to understand the impact of these exposures on employee health and how best to devise appropriate exposure monitoring and control strategies. Until clearer understandings emerge, the limited evidence available suggests caution when potential exposures to unbound engineered nanoscale particles (UNP) may occur.

1. Scope

1.1 This guide describes actions that could be taken by the user to minimize human exposures to unbound, engineered nanoscale particles (UNP) in research, manufacturing, laboratory and other occupational settings where UNP may reasonably be expected to be present. It is intended to provide guidance for controlling such exposures as a cautionary measure where neither relevant exposure standards nor definitive hazard and exposure information exist.

1.2 *General Guidance*—This guide is applicable to occupational settings where UNP may reasonably be expected to be present. Operations across those settings will vary widely in the particular aspects relevant to nanoscale particle exposure control. UNP represent a vast variety of physical and chemical characteristics (for example, morphology, mass, dimension, chemical composition, settling velocities, surface area, surface chemistry) and circumstances of use. Given the range of physical and chemical characteristics presented by the various UNP, the diversity of occupational settings and the uneven

empirical knowledge of and experience with handling UNP materials, the purpose of this guide is to offer general guidance on exposure minimization approaches for UNP based upon a consensus of viewpoints, but not to establish a standard practice nor to recommend a definite course of action to follow in all cases.

1.2.1 Accordingly, not all aspects of this guide may be relevant or applicable to all circumstances of UNP handling. The user should apply reasonable judgment in applying this guide including consideration of the characteristics of the particular UNP involved, the user's engineering and other experience with the material, and the particular occupational settings where the user may apply this guide. Users are encouraged to obtain the services of qualified professionals in applying this guide.

1.2.2 *Applicable Where Relevant Exposure Standards Do Not Exist*—This guide assumes that the user is aware of and in compliance with any authoritative occupational exposure standard applicable to the bulk form of the UNP. This guide may be appropriate where such exposure standards do not exist, or where such standards exist, but were not developed with consideration of the nanoscale form of the material.

1.3 *Applicable Where Robust Risk Information Does Not Exist*—This guide assumes the absence of scientifically sound risk assessment information relevant to the particular UNP

¹ This guide is under the jurisdiction of ASTM Committee E56 on Nanotechnology and is the direct responsibility of Subcommittee E56.03 on Environment, Health, and Safety.

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