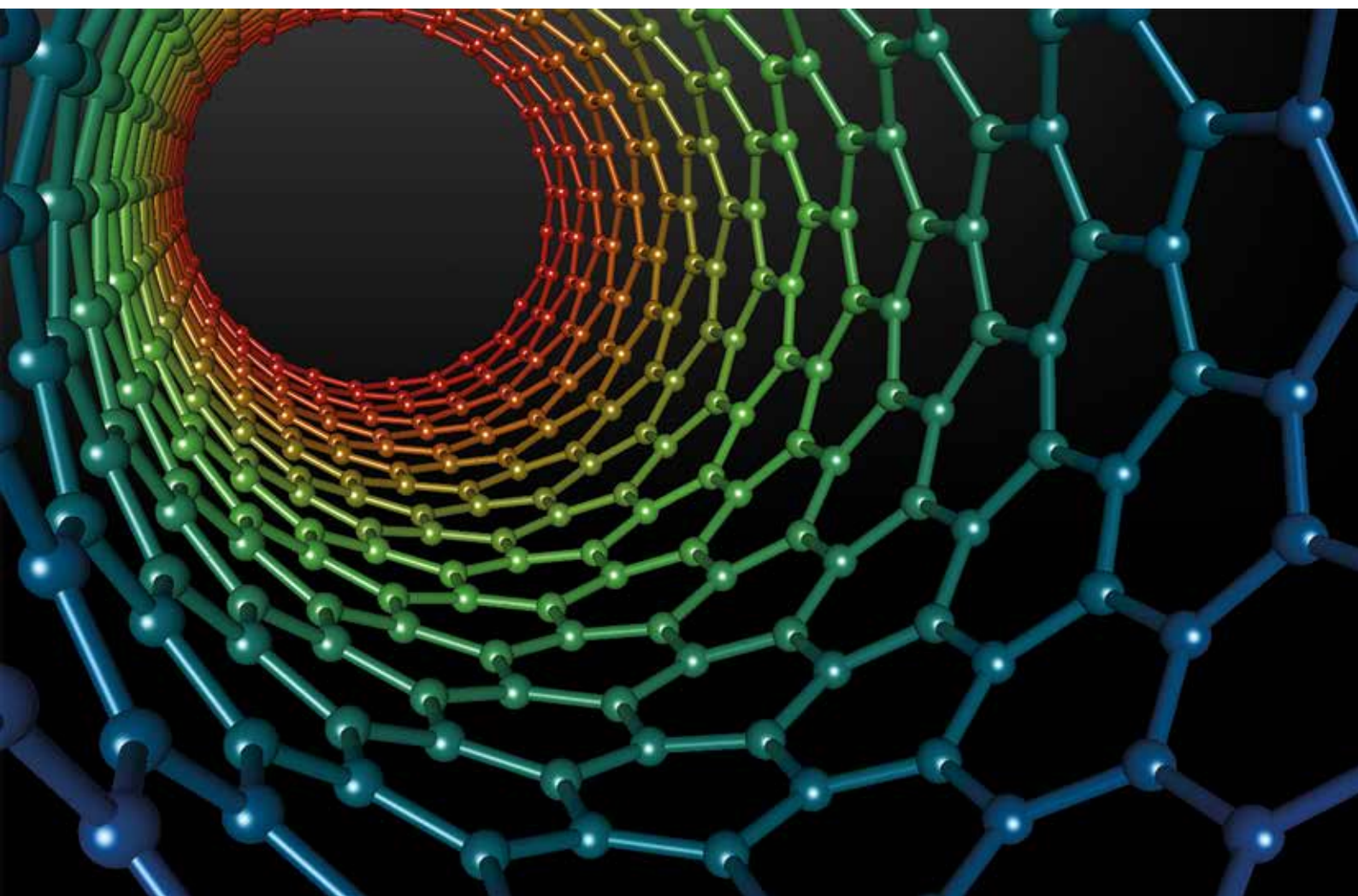


**WHO GUIDELINES**  
**ON PROTECTING WORKERS**  
**FROM POTENTIAL RISKS**  
**OF MANUFACTURED NANOMATERIALS**



**World Health  
Organization**



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WHO guidelines on protecting workers from potential risks of manufactured nanomaterials  
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# GLOSSARY

**Acute exposure**

Exposure occurring over a short time, generally less than one day.

**Acute effect**

A health or physiological effect that occurs suddenly over hours or days, for example lung inflammation resulting from inhalation exposure.

**Aerosol**

Mixture of small particles (solid, liquid or a mixed variety) and a carrier gas (usually air).

**Breathing zone**

The area immediately surrounding a worker's nose and mouth from where the majority of air is drawn into their lungs.

**Bulk material**

The larger counterpart of a nanomaterial not confined to the nanoscale in any dimension, e.g. gold as the bulk material and nano-gold as the nano-form material.

**Carbon nanofibres**

Cylindrical nanostructures with graphene layers arranged as stacked cones, cups or plates.

**Carbon nanotubes**

Hollow nano-objects with two similar external dimensions in the nanoscale and the third dimension significantly larger, composed of carbon (ISO/TS 80004-3:2010).

**Chronic effect**

An effect that occurs or builds up over a long period; for humans over years, for example cardiovascular disease.

**Chronic exposure**

Exposure over a long period, for humans over years.

**Confounder**

A factor in an exposure study that is both related to the exposure and to the outcome. The uneven distribution of the confounder will lead to distorted or spurious results.

**Control banding**

A risk management approach to identify and recommend exposure control measures for potentially hazardous substances for which toxicological information is limited.

**Engineering controls**

Use of mechanical or technical measures such as enclosure, ventilation and workplace design to minimize exposure.

**Fibre diameter**

Fibre dimension.

**Fibre length**

Fibre dimension.

**Grading of Recommendations, Assessment, Development and Evaluations (GRADE)**

A systematic and explicit approach to making judgements about quality of evidence and strength of recommendations. GRADE also stands for GRADE working group, the group that formulates the guidelines for the approach.

**Globally Harmonized System of Classification and Labelling of Chemicals**

A classification and labelling system developed by the United Nations, addressing classification of chemicals by types of hazard and proposing harmonized hazard communication elements, including labels and safety data sheets.

**Granular biopersistent particles**

Particles that are characterized as respirable granular and biopersistent but not fibrous. Also known as "poorly soluble particles" or as "poorly soluble, low-toxicity particles".

**Hazard**

The inherent potential to cause physical or psychological harm to the health of people.

**Manufactured nanomaterials**

Solid, particulate substances intentionally manufactured at the nanoscale, consisting of nano-objects with at least one dimension between 1 and 100 nm, and their aggregates and agglomerates.

**Multi-walled carbon nanotubes**

Tubes of multiple concentric cylindrical one-atom-thick layers of graphene as opposed to single-walled nanotubes (SWCNTs).

**Nano-object**

A material with one, two or three external dimensions in the nanoscale.

**Nano-objects and their aggregates and agglomerates**

Nano-objects (< 100 nm) and their aggregates and agglomerates (> 100 nm).

**Nanoparticle**

Nano-object with all three external dimensions in the nanoscale (< 100 nm diameter).

**Nanoscale**

Size range from approximately 1 nm to 100 nm.

**Occupational exposure limit**

Maximum concentration of airborne contaminants deemed to be acceptable, as defined by the authority having jurisdiction (ISO 16972:2010).

**Particulate matter**

A mixture of solid particles and liquid droplets suspended in the air.

**Personal protective equipment**

Equipment (clothing, gloves, hard hat, respirator and so on) worn by an individual to minimize risk to the individual's health and safety.

**PICO**

Systematic framework to answer the scoping questions, used as an acronym: P for Population, I for Intervention, C for Comparator, O for Outcome(s).

**Protection factor (PF)**

The ratio of exposure level without the controls divided by the exposure level with the controls. If the PF is > 1, controls reduce exposure. A PF of 10 indicates that controls reduce exposure by 90%.

**Read across**

Transfer of hazard information from one material to another based on similarities between the materials.

**Safety data sheet**

Document that provides information on the properties of hazardous chemicals, how they affect health and safety in the workplace and how to manage hazardous chemicals in the workplace (ISO/TR13329:2012).

**Short-term exposure limit**

Fifteen-minute time-weighted average (TWA) exposure which should not be exceeded at any time during a workday, even if the 8-hour TWA is within the threshold limit value TWA.

**Single-walled carbon nanotubes**

A cylindrical one-atom-thick layer of graphite called graphene as opposed to multi-walled nanotubes.

**Solubility**

The ability of a material to release ions in water or in another liquid. Solubility may be expressed by the dissolution rate of the material and may also be described using words such as insoluble, very soluble or poorly soluble.

**Threshold limit value**

Health-based occupational exposure limit value published by the American Conference of Governmental Industrial Hygienists.

**Tiered approach**

A stepwise approach in which each step has an increased level of complexity; here it refers to a risk-based approach for conducting an exposure or release assessment to determine whether exposure to manufactured nanomaterials (MNM)s may occur and to determine if there is a need for further risk management steps to be taken.<sup>1</sup>

**Time-weighted average**

An average concentration of an airborne

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