

ISO/TS 12901-1:2024-08 (E)

Nanotechnologies - Occupational risk management applied to engineered nanomaterials - Part 1: Principles and approaches

Contents		Page
Foreword		v
Introduction		vii
1	Scope	1
2	Normative references	1
3	Terms and definitions	1
4	Abbreviated terms	3
5	Nanomaterial types and characteristics	5
5.1	General	5
5.2	Fullerenes	5
5.3	Carbon nanotubes	5
5.4	Graphene	5
5.5	Nanowires	6
5.6	Quantum dots	6
5.7	Metals and metal oxides, ceramics	6
5.8	Carbon black	6
5.9	Organic nanoparticles	6
5.10	Dendrimers	6
5.11	Nanoclays	6
6	Nanomaterial hazard, exposure and risk	7
6.1	General	7
6.2	Risk to health	7
6.2.1	Hazard information	7
6.2.2	Exposure	8
6.3	Risks to safety	10
6.3.1	Hazard information	10
6.3.2	Risk of fire and explosion from NOAA	10
7	General approach to managing risks from NOAA	11
8	Identification and competence of person conducting risk assessment	12
9	Information collection	12
10	Health risk evaluation	13
10.1	General	13
10.2	Hazard assessment	14
10.3	Exposure assessment	14
10.4	Health risk assessment and prioritization	15
10.5	Document and review	15
11	Control of risk	15
11.1	Hierarchy of control	15
11.2	Control measures	16
11.2.1	General	16
11.2.2	Elimination	16
11.2.3	Substitution/modification	16
11.2.4	Enclosures/isolation	16
11.2.5	Engineering controls	16
11.2.6	Administrative controls	17
11.2.7	Personal protective equipment	17

11.3	Selection of controls	18
11.3.1	General	18
11.3.2	Hazard-based control.....	18
11.3.3	Control banding and other qualitative approaches.....	19
11.3.4	Safety-by-design approach.....	19
11.3.5	“State of the art” approaches.....	19
11.4	Evaluation of the effectiveness of control measures.....	19
11.5	Information, instruction and training.....	20
12	Measurement methods.....	21
12.1	Need for measurement.....	21
12.2	Selection of instruments.....	21
12.3	Sampling strategy.....	24
12.3.1	Air sampling.....	24
12.3.2	Surface sampling.....	25
12.4	Limitations.....	26
13	Health surveillance.....	27
14	Spillages and accidental releases.....	27
15	Disposal procedures.....	28
15.1	General.....	28
15.2	Planification of storage and disposal of nanomaterials	28
15.3	Storage of nanomaterial waste prior to disposal	30
15.3.1	General.....	30
15.3.2	Storage in waste containers.....	30
15.3.3	Storage in plastic bags.....	30
15.4	Disposal of nanomaterial waste.....	30
16	Prevention of fire and explosion.....	31
Annex A (informative) NOAA categories.....		33
Annex B (informative) Additional information on dermal and ocular exposure.....		34
Annex C (informative) Guidance and articles on “State of the art” approaches to control measures.....		35
Bibliography.....		36