



NICNAS Information Sheet

Summary of call for information on the use of Nanomaterials

January 2007

Background

Nanomaterials are materials designed at the molecular (nanometre) level to take advantage of their small size and/or novel properties which are generally not seen in their conventional bulk form. Nanomaterials which are considered to be industrial chemicals fall within the scope of the National Industrial Notification and Assessment Scheme (NICNAS).

There is increasing research, development and use of nanomaterials, and NICNAS needs to ensure that the regulatory regime is appropriate for assessing and regulating nanomaterials in order to protect human health and the environment. To do so, it is necessary to understand both the hazards of the nanomaterials and potential exposures that are likely to occur.

Purpose and scope of the call for information

There is little publicly available information on which nanomaterials are used for industrial (including domestic and cosmetic) purposes in Australia. Information on the use of nanomaterials is a first step in understanding the potential for exposure. To obtain this information, NICNAS issued a voluntary call for information on nanomaterials in the Chemical Gazette of February 2006. The call for information was directed to all persons who manufactured or imported nanomaterials or products (mixtures) containing nanomaterials for industrial uses during 2005 and 2006. Companies were asked to provide information on the types of nanomaterials, their volume of introduction and uses. Nanomaterials used exclusively as therapeutic goods (such as sunscreens), food or food additives and agricultural or veterinary chemicals, do not fall within the scope of NICNAS and were consequently outside the call for information.

There is currently no agreed national or international definition of nanomaterials. For the purposes of the call for information, NICNAS used the broad definition for nanomaterials as those materials that have been specifically engineered to have at least one dimension less than 100nm. The key information sought included the type and volume of nanomaterials introduced into Australia, as well as the availability of those nanomaterials to the public.

Additional steps taken

In addition to publishing the notice in the Chemical Gazette, NICNAS undertook a number of steps to ensure a more complete response. NICNAS worked with industry representatives and also directly contacted companies in specific sectors. Over 200 letters were sent to companies that import and/or manufacture industrial chemicals. The majority of letters were sent to the cosmetics, paints and surface coatings sectors because these sectors are often reported as having commercialised products that contain nanomaterials.

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Industry associations that assisted with this targeted initiative included the Australian Paint Manufacturers Federation (APMF), ACCORD Australasia (Advocate for the Consumer, Cosmetic, Hygiene and Specialty Products Industry) and Plastics and Chemicals Industries Association (PACIA). Companies that have been associated with nanomaterials, either through internet searches, information provided by others or as listed in publications (such as the Friends of the Earth Nanomaterials, Cosmetics and Sunscreens Report, May 2006) were also contacted. Research organisations understood to be involved in nanotechnology were also included in our mailing list in order to capture information on nanomaterials that are close to commercialization.

Results of the call for information

The responses to the call for information have been collated and analysed. To ensure confidentiality of commercial information, the data have been aggregated and presented in ranges and some more generic chemical names have been used (see Table 1).

Companies reported introducing approximately 21 types of organic (e.g. polymers) and inorganic (e.g. metal oxides) nanomaterials. Seventeen of the 21 nanomaterials are for commercial use, with four used for research and developmental purposes. The commercial applications can be classified mainly into surface coatings, printing, water treatment, catalysts, domestic products and cosmetics. The largest volume of nanomaterial in use (10,000 - 50,000 tonnes/year) is acrylic latex, which is used for surface coatings. Over half of the nanomaterials are used in volumes of less than 1 tonne/year and 4 out of 17 nanomaterials are used in volumes of less than 0.1 tonnes/year. The largest group of nanomaterials reported was the metal oxides, which are used in surface coatings, water treatment, catalysts and cosmetics, printing and domestic products. There are several silica-based nanomaterials, which are used for water treatment, cosmetics, surface coatings and printing. All the nanomaterials are imported, principally in products (mixtures). Acrylic latex, zinc oxide cerium oxide and silicon dioxide are also manufactured in Australia.

Fifteen companies reported that they imported nanomaterials (or products containing nanomaterials) for commercial use, 4 companies reported that they manufacture nanomaterials for commercial use and 4 companies reported that they formulate products containing nanomaterials for commercial use.

It is noted, with the assistance of ACCORD, that some cosmetics companies experienced difficulty in applying the definition of nanomaterials as defined in the NICNAS call for information. The difficulties related to the technical problem in defining a nanomaterial, especially with regard to product formulations of either nanoemulsions or liposomes. In addition, cosmetics formulated by nanotechnologies such as nanoemulsions, liposomes, oleosomes, nanocapsules are typically outside the size range (less than 100nm) as specified in NICNAS's voluntary information call. Their typical size ranges are as follows:

- Nanoemulsions: 20-500nm, typically 100-200nm (dispersed phase droplets in a continuous phase)
- Liposome: 100-300nm (water core with lipid outer layers for soluble functional ingredients)
- Oleosome: 150-500nm (oil core for oil-soluble functional ingredients)
- Nanocapsule: 100-600nm (generally polymer based capsules).

Therefore, specific information on each of these chemicals (nanoemulsions, nanosomes (including liposomes and oleosomes) and nanocapsules) in cosmetics was not provided.

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As this was a voluntary information call, it is recognised that gaps in the information are likely to exist. Therefore, the total volume of usage and the type of nanomaterials collated in this report may not fully represent the actual usage in Australia. However, NICNAS followed up a considerable number of possible leads and the majority of companies contacted responded that they did not introduce nanomaterials and those that did introduce nanomaterials provided information. In particular, all multinational cosmetic companies mentioned in the Friends of the Earth report were contacted. Therefore, NICNAS considers that the overall response was reasonable and gives a representative picture of use of nanomaterials for industrial (including domestic and cosmetic uses) in Australia.

Table 1: Usage of nanomaterials in commercial sector in Australia

Chemical Name	Application	Total volume (tonnes per year)
Acrylic latex	Surface coatings	10,000-50,000
Aluminium oxide	Printing	0.05-0.1
Aluminosilicates	Water treatment	10-50
Carbon black pigment	Surface coatings	10-50
Cerium oxide	Catalysts	1-5
Iron oxide	Surface coatings	1-5
	Cosmetics	<0.01
Pearl powder	Cosmetics	0.01-0.05
Phthalocyanine	Surface coatings	10-50
Polyurethane resin	Surface coatings	<0.01
Silica Dimethyl Silylate	Cosmetics	<0.01
Silicon dioxide	Surface coatings	10-50
	Water treatment	0.05-0.1
Sodium silicates	Water treatment	0.1-0.5
Surface treated silicon dioxide	Printing	1-5
Surface treated Aluminium oxide	Printing	0.1-0.5
Surface treated Titanium oxide	Printing	0.5-1
Titanium dioxide	Water treatment	5-10
	Domestic products	1-5
	Cosmetics	1-5
Zinc oxide	Surface coatings	5-10
	Cosmetics	1-5

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Use of the information

The information has provided NICNAS with a general understanding of the extent of use of nanomaterials in Australia and will assist in prioritising regulatory efforts to ensure safe introduction of nanomaterials. The response to the call for information provides a baseline for future surveys on the extent of use of nanomaterials.

In addition, the call for information has enabled NICNAS to establish links with companies known to introduce nanomaterials. In the future, NICNAS will be able to contact these companies and provide them with opportunities to input into any proposed regulatory activity regarding nanomaterials.

NICNAS would like to thank those companies that responded to this call for information and the assistance provided by the industry associations. NICNAS encourages companies that did not respond to the call for information or are proposing to introduce nanomaterials in the near future to contact NICNAS. This will assist NICNAS to maintain up to date knowledge of the use of nanomaterials in Australia and build more links with industry.

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