Supplementary information

How important is drinking water exposure for the risks of engineered nanoparticles to consumers?

Karen Tiede, Steffen Foss Hanssen, Paul Westerhoff, Gordon J Fern, Steven M Hankin, Robert J Aitken, Qasim Chaudhry, Alistair BA Boxall

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S1 Scoring system developed for exposure comparison

Nanomaterial properties

A scoring system for the concentration of the nanomaterial in the product was given as:

Concentration	Range in Product %	Scoring
High	10 – 100	1
Medium	1 – 10	2
Low	0.1 – 1	3
Very Low	< 0.1	4

The location of the nanomaterial within a product was given as:

Location of Nanomaterial	Description
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Surface Bound	Nanomaterial active at the product-air interface
Suspended in Liquid	Nanomaterial unbound within the liquid
Suspended in Solid	Nanomaterial embedded / isolated within a solid matrix

The location of the nanomaterial is used in the consideration of the *likelihood* of consumer contact (Application/Frequency) and Release Potential.

Application / Frequency

For product application (frequency of use rates for each product per person) the physical nature of the product and the extent of human interaction / contact was considered. For example, products such as cosmetics, car waxes, clothing, mobile phones and personal care items are all intended to be directly handled by consumers and are therefore scored highly (score = 1). Products such as paints, car shock absorbers and fuel additives are not intended for direct consumer contact but may come into infrequent contact (e.g. splashes, maintenance) and are subsequently scored lower (score = 2). Some products are not intended to come into contact with consumers under normal circumstances (e.g. self cleaning glass) and are scored accordingly (score = 3). The scoring system for application/frequency is summarised below:

Application	Contact	Scoring
Consumer contact intended and likely	High	1
Consumer contact not Intended but possible	Medium	2
Consumer contact not Intended and not likely	Low	3

The scoring system for market penetration is summarised below:

Market Penetration	Scoring
High	1
Medium	2
Low	3
Very Low	4

Release Potential

The release potential considers the ease of which the nanomaterial can come into contact with the consumer. The products have been scored according to the location of the nanoparticles:

Nanomaterial Location	Release Potential	Scoring
Suspended in Liquid	Highly Likely	1
Surface Bound	Likely / Unlikely	2
Suspended in Solids	Unlikely	3

S2 List of products containing nanomaterials available on the UK market (validated)

Product ID	No.	Product	Source	ENP type	Product use in t (Wijnhoven et al. 2009)
1	1	cotton sheet set	Nanotechnology: Small is beautiful but is it safe? (2009)	Ag	>10,000 (coatings, paints)
2	2	A range of nano - coatings for different purposes	www.nanoprotect.co.uk/	Ag	100-1,000
2	3	A range of nano - coatings for different purposes	www.nanoprotect.co.uk/	TiO2	100-1,000
3	4	A range of nano - coatings for different purposes	www.paintprotectionsystems.com/	C	unknown
4	5	Wound Dressings	www.nanotechproject.org/inventories/consumer/	Ag	1,000-10,000
4	6	Wound Dressings	www.nanotechproject.org/inventories/consumer/	C	1,000-10,000
5	7	eye lift	Nanotechnology: Small is beautiful but is it safe? (2009)	lipid encapsulates	1,000-10,000
6	8	replacement filter cartridge	www.nanotechproject.org/inventories/consumer/	Ag	10-100
6	9	replacement filter cartridge	www.nanotechproject.org/inventories/consumer/	C	10-100
6	10	replacement filter cartridge	www.nanotechproject.org/inventories/consumer/	Cu	10-100
6	11	replacement filter cartridge	www.nanotechproject.org/inventories/consumer/	ZnO	10-100
7	12	natural shower filter	www.nanotechproject.org/inventories/consumer/	Ag	10-100
7	13	natural shower filter	www.nanotechproject.org/inventories/consumer/	C	10-100
8	14	Gel Nano	Nanotechnology: Small is beautiful but is it safe? (2009)	TiO2	1,000-10,000
9	15	Bath and Sports Towels	www.nanotechproject.org/inventories/consumer/	Ag	10-100
10	16	Bicycle Fixed Shorts, Three-Piece Cycling Suit	www.nanotechproject.org/inventories/consumer/	n/a	10-100
11	17	Treatment Kit	Nanotechnology: Small is beautiful but is it safe? (2009)	proteins	1,000-10,000
12	18	Biorepair Toothpaste	www.boots.com (replaced?)	SiO2	1,000-10,000
13	19	A range of socks	www.nanotechproject.org/inventories/consumer/	Ag	>10,000 (coatings, paints)
14	20	concealer	www.corporatewatch.org.uk/download.php?id=61	AlO	1,000-10,000
15	21	finish on paint	www.corporatewatch.org.uk/download.php?id=61	ceramic	>10,000

Product ID	No.	Product	Source	ENP type	Product use in t (Wijnhoven et al. 2009)
16	22	various cosmetics	www.corporatewatch.org.uk/download.php?id=61	AlO	1,000-10,000
17	23	Vacuum Cleaners	www.corporatewatch.org.uk/download.php?id=61	Ag	100-1,000 (cleaning)
18	24	snowboard	www.corporatewatch.org.uk/download.php?id=61	C	10-100
19	25	bicycle parts	www.ukbikestore.co.uk/product/150/ea2004479/...html	CNT	10-100
20	26	Double Core Tennis Balls	www.corporatewatch.org.uk/download.php?id=61	clay	10-100
21	27	Dry Waterless Wash	www.nanotechproject.org/inventories/consumer/	SiO ₂	100-1,000
21	28	Dry Waterless Wash	www.nanotechproject.org/inventories/consumer/	ZnO	100-1,000
22	29	Fuel Borne Catalyst	www.nanotechproject.org/inventories/consumer/	CeO	unknown
23	30	Golf Shaft	www.midasgolf.co.uk	n/a	10-100
24	31	Golf Shaft	www.corporatewatch.org.uk/download.php?id=61	CNT	10-100
25	32	Car Polish	www.corporatewatch.org.uk/download.php?id=61	ZnO	100-1,000
26	33	Razor	www.nanotechproject.org/inventories/consumer/	n/a	1,000-10,000
27	34	golf clubs	www.corporatewatch.org.uk/download.php?id=61	C60	10-100
27	35	Golf clubs	www.corporatewatch.org.uk/download.php?id=61	Ti	10-100
28	36	Tiles	www.corporatewatch.org.uk/download.php?id=61	TiO ₂	>10,000
29	37	water-based paints	www.rhino247.co.uk/pdf/i-cannano/...pdf	Fe ₂ O ₃	>10,000
30	38	interior and exterior paint	www.corporatewatch.org.uk/download.php?id=61	n/a	>10,000
31	39	racket frames	www.nanotechproject.org/inventories/consumer/	C	10-100
31	40	racket frames	www.nanotechproject.org/inventories/consumer/	Ti	10-100
32	41	Ionomer Restorative	http://solutions.3m.co.uk/wps/portal/3M/en_GB/...html	SiO ₂	1,000-10,000
32	42	Ionomer Restorative	http://solutions.3m.co.uk/wps/portal/3M/en_GB/...html	Zr	1,000-10,000
33	43	Cosmetics	www.corporatewatch.org.uk/download.php?id=61	C60	1,000-10,000
33	44	Cosmetics	www.corporatewatch.org.uk/download.php?id=61	lipid encapsulates	1,000-10,000
34	45	Cosmetics	www.nanotechproject.org/inventories/consumer/	SiO ₂	1,000-10,000
35	46	cosmetics	Nanotechnology: Small is beautiful but is it safe? (2009)	C60	1,000-10,000
36	47	chinos	Nanotechnology: Small is beautiful but is it safe? (2009)	n/a	>10,000 (coatings, paints)
37	48	Hybrid Composite	http://mediceptdental.co.uk/products/...html	n/a	1,000-10,000
38	49	various polish/wax	www.corporatewatch.org.uk/download.php?id=61	silazane	100-1,000
38	50	various polish/wax	www.corporatewatch.org.uk/download.php?id=61	SiO ₂	100-1,000
38	51	various polish/wax	www.corporatewatch.org.uk/download.php?id=61	ZnO	100-1,000
39	52	Locking Mist	www.nanotechproject.org/inventories/consumer/	keratin fibres	1,000-10,000

Product ID	No.	Product	Source	ENP type	Product use in t (Wijnhoven et al. 2009)
39	53	Nanofibers	www.nanotechproject.org/inventories/consumer/	keratin fibres	1,000-10,000
39	54	Nanogaine	www.nanotechproject.org/inventories/consumer/	keratin fibres	1,000-10,000
39	55	Nanoguard	www.nanotechproject.org/inventories/consumer/	keratin fibres	1,000-10,000
39	56	Nanoscalp	www.nanotechproject.org/inventories/consumer/	keratin fibres	1,000-10,000
39	57	Nanothick	www.nanotechproject.org/inventories/consumer/	keratin fibres	1,000-10,000
40	58	Mask	www.corporatewatch.org.uk/download.php?id=61	n/a	1,000-10,000
41	59	car polish range	www.corporatewatch.org.uk/download.php?id=61	SiO ₂	100-1,000
41	60	car polish range	www.corporatewatch.org.uk/download.php?id=61	ZnO	100-1,000
42	61	wax	www.corporatewatch.org.uk/download.php?id=61	SiO ₂	100-1,000
42	62	wax	www.corporatewatch.org.uk/download.php?id=61	ZnO	100-1,000
43	63	Badminton Racket	www.corporatewatch.org.uk/download.php?id=61	CNT	10-100
44	64	Golf club	www.corporatewatch.org.uk/download.php?id=61	CNT	10-100
45	65	Tennis rackets	www.corporatewatch.org.uk/download.php?id=61	CNT	10-100
46	66	car shampoo	Nanotechnology: Small is beautiful but is it safe? (2009)	n/a	100-1,000
47	67	badminton rackets	www.corporatewatch.org.uk/download.php?id=61	CNT	10-100
48	68	Squash rackets	www.corporatewatch.org.uk/download.php?id=61	CNT	10-100
49	69	Tennis rackets	www.corporatewatch.org.uk/download.php?id=61	CNT	10-100
50	70	various cosmetics	www.corporatewatch.org.uk/download.php?id=61	lipid encapsulates	1,000-10,000
51	71	various cosmetics	www.corporatewatch.org.uk/download.php?id=61	AIO	1,000-10,000
52	72	Hockey Sticks	www.corporatewatch.org.uk/download.php?id=61	CNT	10-100
53	73	Sunscreens	www.corporatewatch.org.uk/download.php?id=61	n/a	1,000-10,000
54	74	Sun Defence	www.nanotechproject.org/inventories/consumer/	TiO ₂ (Mn doped)	1,000-10,000
55	75	Self Cleaning Glass	www.nanotechproject.org/inventories/consumer/	TiO ₂	unknown
56	76	straightener	Nanotechnology: Small is beautiful but is it safe? (2009)	TiO ₂	1,000-10,000
57	77	Golf Club	www.corporatewatch.org.uk/download.php?id=61	CNT	10-100
58	78	Lip Plumper	Nanotechnology: Small is beautiful but is it safe? (2009)	n/a	1,000-10,000
59	79	Refrigerator	Nanotechnology: Small is beautiful but is it safe? (2009)	Ag	>10,000 (food packaging)
60	80	BIOCLEAN	www.nanotechproject.org/inventories/consumer/	TiO ₂	100-1,000
61	81	body lotion	Nanotechnology: Small is beautiful but is it safe? (2009)	n/a	1,000-10,000
62	82	shock Absorbers	www.corporatewatch.org.uk/download.php?id=61	n/a	unknown
63	83	socks	www.corporatewatch.org.uk/download.php?id=61	Ag	>10,000 (coatings, paints)

Product ID	No.	Product	Source	ENP type	Product use in t (Wijnhoven et al. 2009)
64	84	socks	Nanotechnology: Small is beautiful but is it safe? (2009)	Ag	>10,000 (coatings, paints)
65	85	Socks	www.nanotechproject.org/inventories/consumer/	Ag	>10,000 (coatings, paints)
66	86	CoQ10	Nanotechnology: Small is beautiful but is it safe? (2009)	micelles	unknown
67	87	Facial Sun Defence Cream	www.nanotechproject.org/inventories/consumer/	TiO2 (Mn doped)	1,000-10,000
68	88	Whitening Gentle Toothpaste	www.boots.com	Ca peroxide	1,000-10,000
69	89	Algae Inhibitor	www.nanotechproject.org/inventories/consumer/	SiO2	unknown
70	90	Tennis Rackets	www.corporatewatch.org.uk/download.php?id=61	CNT	10-100
71	91	Tennis Racket	www.babolatshop.co.uk	CNT	10-100
72	92	Wax range	www.nanotechproject.org/inventories/consumer/	SiO2	100-1,000
72	93	Wax range	www.nanotechproject.org/inventories/consumer/	ZnO	100-1,000
73	94	Golf Balls	www.corporatewatch.org.uk/download.php?id=61	clay	10-100
74	95	paper	www.corporatewatch.org.uk/download.php?id=61	ceramic	unknown
75	96	Various Air conditioning units	www.corporatewatch.org.uk/download.php?id=61	Ag	10-100
76	97	Various clothing range	www.corporatewatch.org.uk/download.php?id=61	n/a	>10,000 (coatings, paints)
77	98	Various Clothing Lines	www.corporatewatch.org.uk/download.php?id=61	n/a	>10,000 (coatings, paints)
78	99	Various Clothing Lines	www.corporatewatch.org.uk/download.php?id=61	n/a	>10,000 (coatings, paints)
79	100	Various Clothing Lines	www.corporatewatch.org.uk/download.php?id=61	n/a	>10,000 (coatings, paints)
80	101	Various Clothing Lines	www.corporatewatch.org.uk/download.php?id=61	n/a	>10,000 (coatings, paints)
81	102	Various Clothing Lines	www.corporatewatch.org.uk/download.php?id=61	n/a	>10,000 (coatings, paints)
82	103	Various Clothing Lines	www.corporatewatch.org.uk/download.php?id=61	n/a	>10,000 (coatings, paints)
83	104	Various Clothing Lines	www.corporatewatch.org.uk/download.php?id=61	n/a	>10,000 (coatings, paints)

Product ID	No.	Product	Source	ENP type	Product use in t (Wijnhoven et al. 2009)
84	105	Various Clothing Lines	www.corporatewatch.org.uk/download.php?id=61	n/a	>10,000 (coatings, paints)
85	106	Various Clothing Lines	www.corporatewatch.org.uk/download.php?id=61	n/a	>10,000 (coatings, paints)
86	107	Various Clothing Lines	www.corporatewatch.org.uk/download.php?id=61	n/a	>10,000 (coatings, paints)
87	108	Various Clothing Lines	www.corporatewatch.org.uk/download.php?id=61	n/a	>10,000 (coatings, paints)
88	109	Various Clothing Lines	www.corporatewatch.org.uk/download.php?id=61	n/a	>10,000 (coatings, paints)
89	110	Various Clothing Lines	www.corporatewatch.org.uk/download.php?id=61	n/a	>10,000 (coatings, paints)
90	111	Various Clothing Lines	www.corporatewatch.org.uk/download.php?id=61	n/a	>10,000 (coatings, paints)
91	112	Various Clothing Lines	www.corporatewatch.org.uk/download.php?id=61	n/a	>10,000 (coatings, paints)
92	113	Various Clothing Lines	www.corporatewatch.org.uk/download.php?id=61	SiO ₂	>10,000 (coatings, paints)
93	114	Various Clothing Lines	www.corporatewatch.org.uk/download.php?id=61	SiO ₂	>10,000 (coatings, paints)
94	115	Various Clothing Lines	www.corporatewatch.org.uk/download.php?id=61	Al	>10,000 (coatings, paints)
95	116	Various Clothing Lines	www.corporatewatch.org.uk/download.php?id=61	SiO ₂	>10,000 (coatings, paints)
96	117	Various cosmetics	www.corporatewatch.org.uk/download.php?id=61	SiO ₂	1,000-10,000
97	118	various cosmetics	www.corporatewatch.org.uk/download.php?id=61	lipid encapsulates	1,000-10,000
98	119	Various cosmetics	www.corporatewatch.org.uk/download.php?id=61	C60 (fulleromes)	1,000-10,000
99	120	Various cosmetics	www.corporatewatch.org.uk/download.php?id=61	ZnO	1,000-10,000
100	121	Various cosmetics	www.corporatewatch.org.uk/download.php?id=61	Vitamin E nanocapsules	1,000-10,000
101	122	Various cosmetics	www.corporatewatch.org.uk/download.php?id=61	lipid encapsulates	1,000-10,000
102	123	Various cosmetics	www.corporatewatch.org.uk/download.php?id=61	ceramid nanocapsules	1,000-10,000

Product ID	No.	Product	Source	ENP type	Product use in t (Wijnhoven et al. 2009)
103	124	various cycle components	www.corporatewatch.org.uk/download.php?id=61	CNT	10-100
104	125	Various mobile phones	www.corporatewatch.org.uk/download.php?id=61	Ag	1,000-10,000
105	126	Various Refrigerators	www.corporatewatch.org.uk/download.php?id=61	Ag	>10,000 (food packaging)
106	127	Various Refrigerators	www.corporatewatch.org.uk/download.php?id=61	Ag	>10,000 (food packaging)
107	128	Various Refrigerators	www.corporatewatch.org.uk/download.php?id=61	Ag	>10,000 (food packaging)
108	129	Various Sunscreens	www.corporatewatch.org.uk/download.php?id=61	TiO ₂	1,000-10,000
109	130	Various Sunscreens	www.corporatewatch.org.uk/download.php?id=61	TiO ₂	1,000-10,000
110	131	Various Sunscreens	www.corporatewatch.org.uk/download.php?id=61	ZnO	1,000-10,000
111	132	Various Sunscreens	www.corporatewatch.org.uk/download.php?id=61	n/a	1,000-10,000
112	133	Various Sunscreens	www.corporatewatch.org.uk/download.php?id=61	n/a	1,000-10,000
113	134	Various Sunscreens	www.corporatewatch.org.uk/download.php?id=61	n/a	1,000-10,000
114	135	Various Sunscreens	www.corporatewatch.org.uk/download.php?id=61	TiO ₂	1,000-10,000
115	136	Various Sunscreens	www.corporatewatch.org.uk/download.php?id=61	ZnO	1,000-10,000
116	137	Various Sunscreens	www.corporatewatch.org.uk/download.php?id=61	ZnO	1,000-10,000
117	138	Various Sunscreens	www.corporatewatch.org.uk/download.php?id=61	ZnO	1,000-10,000
118	139	Various Sunscreens	www.corporatewatch.org.uk/download.php?id=61	ZnO	1,000-10,000
119	140	Various Sunscreens	www.corporatewatch.org.uk/download.php?id=61	ZnO	1,000-10,000
120	141	Various Sunscreens	www.corporatewatch.org.uk/download.php?id=61	C60	1,000-10,000
120	142	Various Sunscreens	www.corporatewatch.org.uk/download.php?id=61	TiO ₂	1,000-10,000
121	143	Various Vacuum Cleaners	www.corporatewatch.org.uk/download.php?id=61	Ag	100-1,000 (cleaning)
122	144	Various Washing Machines	www.corporatewatch.org.uk/download.php?id=61	Ag	100-1,000 (cleaning)
123	145	Washing Machine	Nanotechnology: Small is beautiful but is it safe? (2009)	Ag	100-1,000 (cleaning)
124	146	Tennis Ball	www.nanotechproject.org/inventories/consumer/	n/a	10-100
125	147	Cosmetic range	www.nanotechproject.org/inventories/consumer/	C60	1,000-10,000
126	148	Skin Repair System	Nanotechnology: Small is beautiful but is it safe? (2009)	SiO ₂	1,000-10,000

S3 Categorisation of products containing nanomaterials using the framework developed by Hansen et al.

Product types identified as containing engineered nanomaterials.

S4 Data on emissions from product, market shares and ENM concentrations within a product for different product categories

S4.1. Available and estimated data on concentrations of engineered nanoparticles in different product types

Product type	Engineered NP	Concentration (%)	Reference
car polish/wax	all	5	http://www.fags.org/patents/app/20090025508
clothing	Al	0.01	see S5
clothing	SiO ₂	4	Wu et al. (2009)
clothing (sheets, towels)	Ag	0.005	Lee et al. (2003)
clothing (socks)	Ag	0.27	Benn & Westerhoff (2008); see S4
coating	Ag	0.001-0.1	Boxall et al. (2007)
coating	ceramic	10	Boxall et al. (2007)
coating (paints)	TiO ₂	5	Boxall et al. (2007)
coating (aquarium)	SiO ₂	100	see S5
cosmetic	Al ₂ O ₃	3	http://www.freepatentsonline.com/y2005/0074473.html
cosmetic	encapsulates	4	Mueller et al. (2006)

(cream)			
cosmetic (lotion)	ZnO	6	http://www.olay.com/boutique/complete/products/co1001?tab=ingrelist
cosmetics (cream)	C60	0.25	Boxall et al. (2007)
cosmetics	SiO ₂	15	http://www.freepatentsonline.com/6335037.html
cosmetics (lipstick)	all	0.3	Boxall et al. (2007)
food supplement	micelles	22	http://www.aquanova.de/media/public/pds/PDS_Q1022_NovaSOL%20Q.pdf
fuel additive	CeO	0.001	Wakefield et al. (2008)
hair loss treatment	keratin	10	http://www.freepatentsonline.com/4369037.html
paint (coating)	all	10	http://www.fleetwood.ie/Data%20Sheets/Safety%20Data%20Sheets/Amazing_White_Ceiling_Paint.pdf
sunscreen (cream)	C60	0.25	Boxall et al. (2007)
sunscreen	TiO ₂	5-25	CosIng (Internet); http://www.oxonica.com/_get_file.php?file=17_1_spcarticle-optisol.pdf&cat=papers_and_pubs ;
sunscreen	ZnO	9-25	CosIng (Internet; based on TiO ₂); cosmetic database (Internet); http://www.skin-care-support.org/products/soleo-organics-sunscreen.html ; http://www.solsunguard.com/zcote_brochure.pdf
toothpaste	all	15	http://www.blanxuk.com/wp-content/uploads/2009/07/BlanX-Classic.pdf
washing machine	Ag	100	see S5

S4.2. Usage scenarios for emissions to wastewater treatment

Product type	Engineered NP	Emission (g/pc/d)	Reference
car polish/wax	all	0.3	see S5
clothing	all	89	see S5
coating (cleaners)	all	110	Technical Guidance Document on RA (2003)
coating (aquarium)	SiO ₂	0.002	see S5; http://www.tankguard.co.uk/how.html
cosmetics	all	0.8	Technical Guidance Document on RA (2003)
cosmetics (concealer)	Al ₂ O ₃	0.06	Technical Guidance Document on RA (2003)
cosmetics (lotion)	ZnO	15	Technical Guidance Document on RA (2003)
food supplement	micelles	0.01	Pravst et al. (2010)
fuel additive	CeO	0.007	see S5
hair loss treatment	keratin	0.2	see S5
paint (coating)	all	33	Adams (2005)
sunscreen	all	0.9	Technical Guidance Document on RA (2003); S5

toothpaste	all	2.8	Technical Guidance Document on RA (2003)
washing	Ag	1.375	see S5
machine			

S4.3. Available and estimated data on market shares of different products containing ENPs

Product	Engineered NP	Market share	Reference
car polish	all	<1%	see S6
car polish ¹	SiO ₂	31.7%	see S6
car polish ²	SiO ₂	25.8%	see S6
car polish ¹	ZnO	31.7%	see S6
car polish ²	ZnO	25.8%	see S6
coating	all	1%	http://www.observatorynano.eu
coating	ceramic	<0.5%	http://www.observatorynano.eu
coating (aquarium)	SiO ₂	<1%	see S6
cosmetics	C60	0.2%	see S6
cosmetics	all	<1%	see S6
cosmetics	Al ₂ O ₃	0.3%	see S6

Product	Engineered NP	Market share	Reference
cosmetics	Al ₂ O ₃	0.0%	see S6
cosmetics	ceramide	0.4%	see S6
cosmetics	encapsulates	0.3%	see S6
cosmetics	encapsulates	0.8%	see S6
cosmetics	encapsulates	2.5%	see S6
cosmetics	encapsulates	0.5%	see S6
cosmetics	SiO ₂	0.5%	see S6
cosmetics	ZnO	2.3%	see S6
fuel additive	CeO	100%	n/a
hair loss treatment	keratin	62%	see S6
paint	all	1%	http://www.observatorynano.eu
sunscreens	C60	<1%	see S6
sunscreens	TiO ₂	70%	Nohynek et al. (2007)
sunscreens	ZnO	30%	Nohynek et al. (2007)
textiles	all	<1%	http://www.observatorynano.eu
toothpaste	Ca	2.6%	see S6
toothpaste	SiO ₄	3.4%	see S6

¹same product containing ZnO and SiO₂ ENPs

²same product containing ZnO and SiO₂ ENPs

S5 Available or estimated ENP concentration and usage data as well as ENP size information for products included in the qualitative ranking

No.	ENP type	Product type	Usage (g/pc/d)	Reference	Conc. (%)	Reference	Mean diameter	Notes	Reference
38	silazane	car polish	0.3	based on assumption	5	http://www.faqs.org/patents/app/20090025508	n/a		
21	SiO ₂	car polish	0.3	based on assumption	5	http://www.faqs.org/patents/app/20090025508	n/a		
38	SiO ₂	car polish	0.3	based on assumption	5	http://www.faqs.org/patents/app/20090025508	n/a		
41	SiO ₂	car polish	0.3	based on assumption	5	http://www.faqs.org/patents/app/20090025508	n/a		
42	SiO ₂	car polish	0.3	based on assumption	5	http://www.faqs.org/patents/app/20090025508	n/a		
72	SiO ₂	car polish	0.3	based on assumption	5	http://www.faqs.org/patents/app/20090025508	n/a	same product than 72, different source	http://www.turtlewaxuk.com/Default.htm
21	ZnO	car polish	0.3	based on assumption	5	http://www.faqs.org/patents/app/20090025508	n/a		
25	ZnO	car polish	0.3	based on assumption	5	http://www.faqs.org/patents/app/20090025508	n/a	same product than 25, different source	
38	ZnO	car polish	0.3	based on assumption	5	http://www.faqs.org/patents/app/20090025508	n/a		
41	ZnO	car polish	0.3	based on assumption	5	http://www.faqs.org/patents/app/20090025508	n/a		
42	ZnO	car polish	0.3	based on assumption	5	http://www.faqs.org/patents/app/20090025508	n/a		
72	ZnO	car polish	0.3	based on assumption	5	http://www.faqs.org/patents/app/20090025508	n/a	same product than 72, different source	http://www.turtlewaxuk.com/Default.htm
13	Ag	clothing	89	Benn & Westerhoff (2009)	0.27	Benn & Westerhoff (2009): pair of socks	25 nm		http://www.nanotechproject.org/process/assets/files/6718/fauss_final.pdf

No.	ENP type	Product type	Usage (g/pc/d)	Reference	Conc. (%)	Reference	Mean diameter	Notes	Reference
63	Ag	clothing	89	Benn & Westerhoff (2009)	0.27	Benn & Westerhoff (2009): pair of socks	150 nm		http://www.nanotechproject.org/process/assets/files/6718/fauss_final.pdf
64	Ag	clothing	89	Benn & Westerhoff (2009)	0.27	Benn & Westerhoff (2009): pair of socks	151 nm		http://www.nanotechproject.org/process/assets/files/6718/fauss_final.pdf
65	Ag	clothing	89	Benn & Westerhoff (2009)	0.27	Benn & Westerhoff (2009): pair of socks	152 nm		http://www.nanotechproject.org/process/assets/files/6718/fauss_final.pdf
1	Ag	clothing	89	based on assumption	0.005	Lee et al. (2003)	25 nm		http://www.nanotechproject.org/process/assets/files/6718/fauss_final.pdf
9	Ag	clothing	89	based on assumption	0.005	Lee et al. (2003)	26 nm		http://www.nanotechproject.org/process/assets/files/6718/fauss_final.pdf
94	Al	clothing	89	based on assumption	0.01	based on assumption	50 nm vapour layer on membrane	n/a	http://www.sympatex.com/technologien/zusatzfunktionen/reflexion
92	SiO2	clothing	89	based on assumption	4	Wu et al. (2009)	n/a		
93	SiO2	clothing	89	based on assumption	4	Wu et al. (2009)	n/a		
95	SiO2	clothing	89	based on assumption	4	Wu et al. (2009)	n/a		
2	Ag	coating	110	TGD (2003)	0.001-0.1	Boxall et al. (2007)	n/a		
15	ceramic	coating	110	based on assumption	10	Boxall et al 2007	n/a		
69	SiO2	coating	0.002	http://www.tankguard.co.uk/how.html	100	based on assumption	n/a		
2	TiO2	coating	110	TGD (2003)	5	Boxall et al 2007	n/a		
55	TiO2	coating	110	TGD (2003)	5	Boxall et al 2007	15 nm coating		http://www.nnin.org/doc/NNIN1017.pdf
60	TiO2	coating	110	TGD (2003)	5	Boxall et al 2007	n/a		
14	AlO	cosmetics	0.06	TGD (2003)	3	http://www.freepatentsonline.com/y2005/0074473.html	n/a		

No.	ENP type	Product type	Usage (g/pc/d)	Reference	Conc. (%)	Reference	Mean diameter	Notes	Reference
16	AlO	cosmetics	0.8	TGD (2003)	3	http://www.freepatentsonline.com/y2005/0074473.html	<100 nm		http://www.organicskincarepro.com/Control-Nano-Ingredients-found-in-Big-Name-Brands-s/145.htm ; http://www.antaria.com/index.php?page=alusion
51	AlO	cosmetics	0.8	TGD (2003)	3	http://www.freepatentsonline.com/y2005/0074473.html	<100 nm		http://www.organicskincarepro.com/Control-Nano-Ingredients-found-in-Big-Name-Brands-s/145.htm
35	C60	cosmetics	0.8	TGD (2003)	0.25	Boxall et al. (2007)	n/a		
125	C60	cosmetics	0.8	TGD (2003)	0.25	Boxall et al. (2007)	n/a		
33	C60	cosmetics	0.8	TGD (2003)	0.25	Boxall et al. (2007)	80-100 nm		http://www.springerlink.com/content/j06r4l5h9716w181/fulltext.pdf
98	C60 (fulleromes)	cosmetics	0.8	TGD (2003)	0.25	Boxall et al. (2007)	n/a		
102	ceramid nanocapsules	cosmetics	0.8	TGD (2003)	4	Mueller et al. (2006)	n/a		
5	lipid encapsulates	cosmetics	0.03	TGD (2003)	4	Mueller et al. (2006)	30-200 nm		http://www.skinetc.co.uk/SkinCareRange/tabid/385/Default.aspx
33	lipid encapsulates	cosmetics	0.8	TGD (2003)	4	Mueller et al. (2006)	80-100 nm		http://www.springerlink.com/content/j06r4l5h9716w181/fulltext.pdf
50	lipid encapsulates	cosmetics	0.8	TGD (2003)	4	Mueller et al. (2006)	500-700 nm		http://www.igilabs.com/patented-technology.html
97	lipid encapsulates	cosmetics	0.8	TGD (2003)	4	Mueller et al. (2006)	500-700 nm		http://www.igilabs.com/patented-technology.html
101	lipid encapsulates	cosmetics	0.8	TGD (2003)	4	Mueller et al. (2006)	30-200 nm		http://www.skinetc.co.uk/SkinCareRange/tabid/385/Default.aspx
11	proteins	cosmetics	0.8	TGD (2003)	4	Mueller et al. (2006)	n/a		
34	SiO2	cosmetics	0.8	TGD (2003)	15	http://www.freepatentsonline.com/6335037.html	>10 nm		
96	SiO2	cosmetics	0.8	TGD (2003)	15	http://www.freepatentsonline.com/6335037.html	>10 nm		

No.	ENP type	Product type	Usage (g/pc/d)	Reference	Conc. (%)	Reference	Mean diameter	Notes	Reference
126	SiO ₂	cosmetics	0.8	TGD (2003)	15	http://www.freepatentsonline.com/6335037.html	<1000 nm		
100	Vitamin E nanocapsules	cosmetics	0.8	TGD (2003)	4	Mueller et al. (2006)	82-144 nm		Liu and Park (2009)
99	ZnO	cosmetics	15	TGD (2003)	6	http://www.oly.com/boutique/complet/products/co1001?tab=ingrelist	n/a		
22	CeO	fuel additive	0.007	based on assumption	0.001	Wakefield et al. (2008)	8-10 nm; 10-20nm	density: 7.13 g/ml	Wakefield et al. (2008); Sajith et al. (2009)
39	keratin fibres	hair treatment	0.2	TGD (2003)	10	http://www.freepatentsonline.com/4369037.html	n/a		
39	keratin fibres	hair treatment	0.2	TGD (2003)	10	http://www.freepatentsonline.com/4369037.html	n/a		
39	keratin fibres	hair treatment	0.2	TGD (2003)	10	http://www.freepatentsonline.com/4369037.html	n/a		
39	keratin fibres	hair treatment	0.2	TGD (2003)	10	http://www.freepatentsonline.com/4369037.html	n/a		
39	keratin fibres	hair treatment	0.2	TGD (2003)	10	http://www.freepatentsonline.com/4369037.html	n/a		
39	keratin fibres	hair treatment	0.2	TGD (2003)	10	http://www.freepatentsonline.com/4369037.html	n/a		
3	C	paint	33	Adams (2005)	10	http://www.fleetwood.ie/Data%20Sheets/Safety%20Data%20Sheets/Amazing_White_Ceiling_Paint.pdf	n/a		
29	Fe ₂ O ₃	paint	33	Adams (2005)	10	http://www.fleetwood.ie/Data%20Sheets/Safety%20Data%20Sheets/Amazing_White_Ceiling_Paint.pdf	10-30nm	surface area: 35-40 m ² /g	Doke and Khanna (2009)
28	TiO ₂	paint	33	Adams (2005)	10	http://www.fleetwood.ie/Data%20Sheets/Safety%20Data%20Sheets/Amazing_White_Ceiling_Paint.pdf	n/a		

No.	ENP type	Product type	Usage (g/pc/d)	Reference	Conc. (%)	Reference	Mean diameter	Notes	Reference
120	C60	sunscreen	0.9	TGD (2003)	0.25	Boxall et al. (2007)	20-40 nm	Withdrawn?	http://www.freewebs.com/jayaram-co/doc/Selected_Appz_of_Nanotechnology_in_Textiles.pdf ; http://www.drhauschka.co.uk/products/sun-care/sunscreen-lotion-spf15
108	TiO2	sunscreen	0.9	TGD (2003)	25	CosIng	20-40 nm		http://www.freewebs.com/jayaram-co/doc/Selected_Appz_of_Nanotechnology_in_Textiles.pdf
109	TiO2	sunscreen	0.9	TGD (2003)	25	CosIng	20-40 nm		http://www.freewebs.com/jayaram-co/doc/Selected_Appz_of_Nanotechnology_in_Textiles.pdf
114	TiO2	sunscreen	0.9	TGD (2003)	25	CosIng	20-40 nm		http://www.freewebs.com/jayaram-co/doc/Selected_Appz_of_Nanotechnology_in_Textiles.pdf
120	TiO2	sunscreen	0.9	TGD (2003)	25	CosIng	20-40 nm		http://www.freewebs.com/jayaram-co/doc/Selected_Appz_of_Nanotechnology_in_Textiles.pdf
54	TiO2 (Mn doped)	sunscreen	0.9	TGD (2003)	25	CosIng	50-60 nm		http://www.raeng.org.uk/events/pdf/Kevin_Matthews.pdf
67	TiO2 (Mn doped)	sunscreen	0.9	TGD (2003)	5	http://www.oxonica.com/_get_file.php?file=17_1_spcarticle-optisol.pdf&cat=papers_and_pubs	70 nm	>97 % rutile	http://www.i-sup2008.org/presentations/Conference_1/Put_S.pdf
110	ZnO	sunscreen	0.9	TGD (2003)	25	CosIng	20-40 nm		http://www.freewebs.com/jayaram-co/doc/Selected_Appz_of_Nanotechnology_in_Textiles.pdf
115	ZnO	sunscreen	0.9	TGD (2003)	22.3	http://www.skin-care-support.org/products/soleo-organics-sunscreen.html	20-40 nm		http://www.freewebs.com/jayaram-co/doc/Selected_Appz_of_Nanotechnology_in_Textiles.pdf
117	ZnO	sunscreen	0.9	TGD (2003)	25	CosIng	20-40 nm		http://www.freewebs.com/jayaram-co/doc/Selected_Appz_of_Nanotechnology_in_Textiles.pdf
119	ZnO	sunscreen	0.9	TGD (2003)	25	CosIng	20-40 nm		http://www.freewebs.com/jayaram-co/doc/Selected_Appz_of_Nanotechnology_in_Textiles.pdf

No.	ENP type	Product type	Usage (g/pc/d)	Reference	Conc. (%)	Reference	Mean diameter	Notes	Reference
116	ZnO	sunscreen	0.9	TGD (2003)	9	http://www.cosmeticsdatabase.com/sunproduct.php?prod_id=219586	<200 nm; 20-60 nm	surface area: 12-24 m ² /g BET	http://www.cosmeticsdatabase.com/sunproduct.php?prod_id=219586 ; http://www.solsunguard.com/zcote_brochure.pdf , http://www.basf.com/group/corporate/en/function/conversions:/publish/content/sustainability/dialogue/in-dialogue-with-politics/nanotechnology/knowledge/images/Wiench_SOT_OekoNano_Poster.pdf
118	ZnO	sunscreen	0.9	TGD (2003)	9	http://www.cosmeticsdatabase.com/sunproduct.php?prod_id=219586	<200 nm; 20-60 nm	surface area: 12-24 m ² /g BET	http://www.cosmeticsdatabase.com/sunproduct.php?prod_id=219586 ; http://www.solsunguard.com/zcote_brochure.pdf , http://www.basf.com/group/corporate/en/function/conversions:/publish/content/sustainability/dialogue/in-dialogue-with-politics/nanotechnology/knowledge/images/Wiench_SOT_OekoNano_Poster.pdf
66	micelles	supplement	0.01	Pravst et al. (2010)	22	http://www.aquanova.de/media/public/pds/PDS_Q1022_NovaSOL%20Q.pdf	30 nm		http://www.revital.co.uk/Solgar_Nutri_Nano_CoQ_10
68	Ca peroxide	toothpaste	2.8	TGD (2003)	15	http://www.blankuk.com/wp-content/uploads/2009/07/BlanX-Classic.pdf	n/a		
12	SiO ₂	toothpaste	2.8	TGD (2003)	15	http://www.blankuk.com/wp-content/uploads/2009/07/BlanX-Classic.pdf	n/a		
122	Ag	washing machine	1.375	Farkas et al. (2008)	100	based on assumption	n/a		
123	Ag	washing machine	1.375	Farkas et al. (2008)	100	based on assumption	n/a		

S6 Available and estimated market shares of products likely to reach the aquatic environment

Product	NP type	Market share	Reasoning	Reference
car polish	all	<1%	not sold on "high street": Assumption that market share is very low = <1%	
car polish	SiO ₂	31.7%	by product: major high street chain sells 120 different car polish/shampoo products from 9 different brands. Out of the 120 products 38 from xxxx wax = 31.7%	http://www.halfords.com/webapp/wcs/stores/servlet/SearchCmd?storeId=10001&langId=-1&catalogId=10151&categoryId=165527&action=listrefine&mode=list&constraints=sor Price 1 rpp 30#catattributes
car polish	SiO ₂	25.8%	by product: major high street chain sells 120 different car polish/shampoo products from 9 different brands. Out of the 120 products 31 from xxxx	http://www.halfords.com/webapp/wcs/stores/servlet/SearchCmd?catalogId=10151&storeId=10001&categoryId=165527&langId=-1&action=listrefine&constraints=teq Brand T-Cut sor Price 1
car polish	ZnO	31.7%	by product: major high street chain sells 120 different car polish/shampoo products from 9 different brands. Out of the 120 products 38 from xxx wax = 31.7%	http://www.halfords.com/webapp/wcs/stores/servlet/SearchCmd?storeId=10001&langId=-1&catalogId=10151&categoryId=165527&action=listrefine&mode=list&constraints=sor Price 1 rpp 30#catattributes
car polish	ZnO	25.8%	by product: major high street chain sells 120 different car polish/shampoo products from 9 different brands. Out of the 120 products 31 from car plan/t-cut	http://www.halfords.com/webapp/wcs/stores/servlet/SearchCmd?catalogId=10151&storeId=10001&categoryId=165527&langId=-1&action=listrefine&constraints=teq Brand T-Cut sor Price 1
coating	All	1%	total: Today approximately 1% of the construction related products on the market have nanoenhanced feature(s).	http://www.observatorynano.eu/project/filesystem/files/ObservatoryNANO_Economic%20assessment_construction_final%20report.pdf
coating	Ceramic	<0.5%	total: Market penetration of nano-enhanced construction ceramics is less than 0.5%.	http://www.observatorynano.eu/project/filesystem/files/ObservatoryNANO_Economic%20assessment_construction_final%20report.pdf
coating (aquarium)	SiO ₂	<1%	not sold on "high street": Assumption that market share is very low = <1%	
cosmetics	C60	0.2%	by product: major high street drug store sells 2736 products from 146 brands in the category "skincare" excluding shaving, waxing products. 146 brands have a market share of 0.68% each. Out of : major high street drug store: 5 products by xxxx in skincare; see "Lotion-ZnO"	http://www.boots.com/webapp/wcs/stores/servlet/CatalogSearchResultView?Nr=AND(DIM_BASIC_RECORD_TYPE_ID%3aIS_PURE_PRODUCT%2cDIM_PARENT_PRODUCT_ID%3aIS_PARENT)&Ntk=All&langId=-1&catalogId=11051&Rpp=12&Ne=4294966224&Ntt=dr+brandt&storeId=10052&Ntx=mode%2bmatchall&searchTerm=dr+brandt&Ns=P_IS_HERO_PRODUCT 1&N=4294963984&pageSize=12

Product	NP type	Market share	Reasoning	Reference
cosmetics	all	<1%	not sold on "high street": Assumption that market share is very low = <1%	
cosmetics	AIO	0.3%	by product: 2472 "beauty" products at : major high street drug store of which 8 nano products = 0.32%	http://www.boots.com/en/Revlon/Revlon-Collections/Colorstay/?cm_re=revlon_bt_-_p4a_v1_-_c9083_image1&cm_sp=revlon-_-revlon-_-colorstay_collection_c9083_image1
cosmetics	AIO	0.04%	by product; 1 product out of 2472	http://www.boots.com/webapp/wcs/stores/servlet/CatalogSearchResultView?Nr=AND(DIM_BASIC_RECORD_TYPE_ID%3aS_PURE_PRODUCT%2cDIM_PARENT_PRODUCT_ID%3aS_PARENT)&Ntk=All&langId=-1&catalogId=10552&Rpp=12&Ne=13&Ntt=new+complexion&storeId=10052&Ntx=mode%2bmatchall&searchTerm=new+complexion&Ns=P_IS_HERO_PRODUCTI1&N=4294957192&pageSize=12
cosmetics	ceramid	0.4%	by product: 11 nano products at : major high street drug store out of 2736 = 0.40%. By brand = 0.68% ("skincare")	http://www.boots.com/webapp/wcs/stores/servlet/CatalogSearchResultView?storeId=10052&catalogId=11051&langId=-1&pageSize=12&beginIndex=0&sType=SimpleSearch&resultCatEntryType=2&searchTerm=Zen&newDepSearch=&x=0&y=1
cosmetics	encapsulates	0.3%	by product: major high street drug store sells 8 nano products out of 2736 "skincare" products = 0.29%	http://www.boots.com/webapp/wcs/stores/servlet/CatalogSearchResultView?Nr=AND(DIM_BASIC_RECORD_TYPE_ID%3aS_PURE_PRODUCT%2cDIM_PARENT_PRODUCT_ID%3aS_PARENT)&Ntk=All&langId=-1&catalogId=11051&viewType=listView&No=60&Rpp=12&Ne=13&storeId=10052&Ntx=mode%2bmatchall&N=4294963199+4294957648&Ns=P_IS_HERO_PRODUCTI1&pageSize=12&categoryId=4710&searchv2=true
cosmetics	encapsulates	0.8%	by product: No. of all xxx products = 23 ("skincare")	http://www.boots.com/webapp/wcs/stores/servlet/CatalogSearchResultView?Nr=AND(DIM_BASIC_RECORD_TYPE_ID%3aS_PURE_PRODUCT%2cDIM_PARENT_PRODUCT_ID%3aS_PARENT)&Ntk=All&langId=-1&catalogId=11051&viewType=listView&Rpp=12&Ne=13&storeId=10052&Ntx=mode%2bmatchall&N=4294963199+4294953165&Ns=P_IS_HERO_PRODUCTI1&pageSize=12&categoryId=4710&searchv2=true

Product	NP type	Market share	Reasoning	Reference
cosmetics	encapsulates	2.5%	by product: No. of all xxxx products = 68 ("skincare")	http://www.boots.com/webapp/wcs/stores/servlet/CatalogSearchResultView?Nr=AND(DIM_BASIC_RECORD_TYPE_ID%3aIS_PURE_PRODUCT%2cDIM_PARENT_PRODUCT_ID%3aIS_PARENT)&Ntk=All&langId=-1&catalogId=11051&viewType=listView&Rpp=12&Ne=13&storeId=10052&Ntx=mode%2bmatchall&N=4294963199+4294957342&Ns=P_IS_HERO_PRODUCT11&pageSize=12&categoryId=4710&searchv2=true
cosmetics	encapsulates	0.5%	by product: no. of xxxx products = 13 ("skincare")	http://www.boots.com/webapp/wcs/stores/servlet/CatalogSearchResultView?Nr=AND(DIM_BASIC_RECORD_TYPE_ID%3aIS_PURE_PRODUCT%2cDIM_PARENT_PRODUCT_ID%3aIS_PARENT)&Ntk=All&langId=-1&catalogId=11051&viewType=listView&No=72&Rpp=12&Ne=13&storeId=10052&Ntx=mode%2bmatchall&N=4294963199+4294957664&Ns=DIM_BASIC_RECORD_TYPE_ID11Brand&pageSize=12&categoryId=4710&searchv2=true
cosmetics	SiO ₂	0.5%	by product: 1 out of 195 ("skincare")	http://www.boots.com/en/Salcura-zeoderm-50g_1051891/
cosmetics	ZnO	2.3%	by products: Major high street drug store sells 2736 products from 146 brands in the category "skincare" excluding shaving, waxing products. 146 brands have a market share of 0.68% each. Out of 2736 products xxx has listed 63 products = 2.30%	http://www.boots.com/webapp/wcs/stores/servlet/CatalogSearchResultView?catalogId=11051&categoryId=4710&categoryParentId=&Ne=1&searchv2=true&N=0+4294963199&langId=-1&pageSize=12&storeId=10052
fuel additive	CeO	100%	intended to use in 7000 bus fleet; In 2009/10 there were 85,800 Public Service Vehicles (PSVs) in use in Great Britain, of which 46,900 were buses and 38,900 were coaches and minibuses. 7000 of 85800 = 8.2%; but not all bus companies taken into account - market share could be higher: unknown = scored as high (1)	http://www.oxonica.com/energy/energy_envirox_casestudy_stagecoach2007.php
hair loss treatment	Keratin	62%	by product: Major high street drug store sells 79 "hair loss" products from 10 different brands including xxx. 49 out of the 79 products are xxx products = 62%.	http://www.boots.com/en/Everyday-Essentials/Hair/Problem-Hair/Hair-Loss/
paint	all	1%	total: Today approximately 1% of the construction related products on the market have nanoenhanced feature(s).	http://www.observatorynano.eu/project/filesystem/files/ObservatoryNANO_Economic%20assessment_construction_final%20report.pdf

Product	NP type	Market share	Reasoning	Reference
sunscreens	C60	<1%	not sold on "high street": Assumption that market share is very low = <1%	
sunscreens	TiO ₂	70%		
sunscreens	ZnO	30%		
textiles	all	<1%	as a result some of nano-enhanced products are being successfully commercialized. However, and despite being a pioneer in the use of nanotechnology in consumer products, nanotechnology still represents a minor share of the total textile market, with less than 1% of all products incorporating nanotechnology.	http://www.observatorynano.eu/project/filesystem/files/ObNa_Economic%20assessment_textile%20sector_final%20report.pdf
toothpaste	Ca	2.6%	by product: Major high street drug store : 117 "tooth care" products by 21 brands; toothpaste: 3 products. Market share by products = 2.56%, by brand 4.76%	http://www.boots.com/webapp/wcs/stores/servlet/CategoryDisplay?Nr=AND(DIM_PREMIUM_BRAND_FLAG%3aN%2cDIM_PARENT_PRODUCT_ID%3aIS_PARENT)&langId=-1&Ntk=DIM_PARENT_CATEGORY_IDS&catalogId=11051&categoryParentId=4822527&Ne=1&Rpp=12&Ntt=4384&storeId=10052&Ntx=mode%2bmatchall&Ns=P_IS_HERO_PRODUCT111CAT_SEQ_4384&N=0&categoryId=4384&st=category&cannonicalUrl=en/Everyday-Essentials/Dental/Toothpaste/
toothpaste	SiO ₄	3.4%	by product: not exact product, but 4 out of 119 by xxx	http://www.boots.com/webapp/wcs/stores/servlet/CatalogSearchResultView?storeId=10052&catalogId=10552&langId=-1&pageSize=12&beginIndex=0&sType=SimpleSearch&resultCatEntryType=2&searchTerm=blanx&newDepSearch=&x=0&y=0
washing machine	Ag	<1%	not sold on "high street": Assumption that market share is very low = <1%	

S7 Assumptions/calculations of product usage and NP concentrations for products where no data was available

All values are conservative estimates: maximum values/worst case scenarios

Product		Estimate	Reasoning
Aquarium treatment	ENP conc. (%)	100	product consists to 100% of SiO ₂ particles (worst case scenario)
Aquarium treatment	Emission (g/pc/d)	0.002	“very low” based on 1x application per aquarium every 10 years; 30mL of product needed for 3m ² (for large aquarium; 1 sachet); 10% of UK households own fish; average house size is 2.35: 30g/10years/365d*0.1*2.35 = 0.002 g/pc/d
Car polish	Emission (g/pc/d)	0.3	Assumption: 1x per month polishing/waxing of every car; applied amount: 200g/wax; 28459000 registered cars in the UK (Statistics UK); 61.5M people live in UK (Statistics UK); 200g of wax times 12 months divided by 365d = 6.6g/car/d; 6.6g/car/d times no. of cars, divided by no. of people: 0.3g/pc/d
Clothing (Al)	ENP conc. (%)	0.01	Density Al = 2.70 g·cm ⁻³ ; 50nm Al layer on membrane (manufacturer's data); assuming therefore each particle has a diameter of 50nm and takes up an area of 50nm*50nm = 2500nm ² = 2500*10 ⁻¹⁸ m ² ; volume of particle: $V = \pi*d^3/6 = 65450nm^3 = 6.0545*10^{-17}cm^3$; volume*density = mass per particle (1.77810 ⁻¹⁶ g) Using the example of an outdoor jacket assuming that a jacket has measurements of 70cm width and 90cm length = 6300cm ² times 2 (front and back) = 12600cm ² area of jacket = 1.26m ² ; Particle number on jacket: 1.26m ² divided by 2500*10 ⁻¹⁸ m ² = 5.04*10 ¹⁴ particles per jacket; no. of particles times mass per particle = 0.089g/jacket Weight per jacket ~1kg: 0.089g Al/kg ~ 0.01%
Clothing (all)	Emission (g/pc/d)	89	UK consumes ~2M t of textiles per year; this is 0.033t/pc/year and 0.000089t/pc/d = 89 g/pc/d (http://www.scribd.com/doc/7439408/Clothing-Waste-Statistic-Uk)
Clothing (SiO ₂)	ENP conc. (%)	4	Best functionality at 4% SiO₂ ENP concentration in product (Wu et al. 2009)
Cosmetics (encapsulates)	ENP conc. (%)	4	For lipid nanoparticles in cosmetics 4% (Mueller et al 2006); assumed to be similar for all organic encapsulates in cosmetics

Product		Estimate	Reasoning
Cosmetics (encapsulates)	Emission (g/pc/d)	0.006	average intake from all sources (mainly natural) is 0.006g/pc/d (Pravst et al 2010)
Food supplement (micelles)	ENP conc. (%)	22	least 22% CoEnzyme Q10 in micelles
Fuel additive	Emission (g/pc/d)	0.007	<p>700M km driven with CeO additive over 3 years by StageCoach; 0.001% CeO added to diesel</p> <p>ENP concentration in fuel: 0.001% or 10ppm (=10mL/L);</p> <p>700M km driven using CeO additive in 3 years = 233333333km/yr = 639269km/d</p> <p>fuel efficiency (diesel vehicles, average for UK): 0.55L/km; 61.5M people in UK;</p> <p>0.55L/km times 639269km/d = 351598L/d of which 0.001% is CeO = 3.52L CeO/d divided by 61.5M people = 0.000057mL/pc/d; in mass: volume times density (7.13g/mL) = 0.0004g/pc/d</p> <p>Can multiply up to total bus fleet in the UK by taking total bus miles for the UK, dividing this by the StageCoach bus miles per year and multiplying the emission by the product of this calc. = 2511/146 * 0.0004 = 0.007 g/pc/d</p>
Hair loss treatment (keratin)	Emission (g/pc/d)	0.2	<p>61.5M people live in UK;</p> <p>1M people suffer from alopecia (http://www.aloppeciaonline.org.uk/research.asp; (Hunt et al. 2004);</p> <p>Assuming all sufferers use hair loss products/shampoos. Usage of shampoo is 12 g/c/d for 61.5M people (TGD 2003) – therefore emission for 1 M people: 0.2 g/c/d</p>
Paints (TiO ₂ , FeO, C)	ENP conc. (%)	10	10% TiO ₂ concentration in product (MSDS); 10% inclusion rate was also assumed for paints containing other types of particles
Paints (TiO ₂ , FeO, C)	Emission (g/pc/d)	33	12kg/pc/year in UK = 33g/pc/d ; ("focus on pigments" 2004)
Socks (Ag)	ENP conc. (%)	0.27	Highest concentration of Ag in one sock =1358ug Ag/g times 2 (pair of socks) = 2716ug Ag/g; this equals 0.27% of nanosilver in a pair of socks (based on Benn & Westerhoff 2008)
Sunscreens	ENP conc. (%)	25	if not available, 25% assumed based on maximum concentration allowed by EU
Sunscreens	Emission (g/pc/d)	0.9	TGD 2003: 24g/pc/d for 2 weeks a year = 0.9g/pc/d

Product		Estimate	Reasoning
Washing machine	ENP conc. (%)	100	the product is considered to be the active ingredient (biocide) and not the washing machine itself, therefore it is assumed that the product consists of 100% nanosilver
Washing machine	Emission (g/pc/d)	1.375	<p>washing cycles based on detergent usage (TGD 2003): maximum usage is 18 tasks per week per household; this equals 2.6 tasks per day/household; average household size UK is 2.35 (UK statistics): 2.6tasks per day divided by 2.35 = 1.1 tasks/pc/d (where tasks equals washes);</p> <p>50L water is used per wash/task (http://www.waterwise.org.uk/reducing_water_wastage_in_the_uk/house_and_garden/washing_clothes.html); 25ug/L Ag released per wash (Farkas et al. 2008): 1.1 tasks/pc/d*50L*25ug Ag/L=1.375g Ag/pc/d</p>

S8 Estimated concentrations in raw and treated drinking water

S8.1. Estimated concentrations in raw and treated drinking water as a measure of mass concentration (ug/L)

type	application	removal	WWTP effluent	WWTP biosolids	WTP influent	WTP conventional	WTP membrane	WTP filtration
		WWTP	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Aluminium and aluminium oxide	all products	0%	1.29E+00	0	1.29E-01	1.29E-03	1.29E-05	4.08E-03
		97%	3.87E-02	1.25E+00	3.87E-03	3.87E-05	3.87E-07	1.22E-04
Ca peroxide	Toothpaste	0%	7.17E+01	0	7.17E+00	7.17E-02	7.17E-04	2.27E-01
		97%	2.15E+00	6.95E+01	2.15E-01	2.15E-03	2.15E-05	6.80E-03
Carbon & C60	all products	0%	2.21E+02	0.00E+00	2.21E+01	2.21E-01	2.21E-03	6.98E-01
		97%	6.62E+00	2.14E+02	6.62E-01	6.62E-03	6.62E-05	2.09E-02
Carbon	all products	0%	2.20E+02	0.00E+00	2.20E+01	2.20E-01	2.20E-03	6.96E-01
		97%	6.60E+00	2.13E+02	6.60E-01	6.60E-03	6.60E-05	2.09E-02
C60	all products	0%	5.77E-01	0	5.77E-02	5.77E-04	5.77E-06	1.82E-03
		79%	1.21E-01	4.56E-01	1.21E-02	1.21E-04	1.21E-06	3.83E-04
		97%	1.73E-02	5.59E-01	1.73E-03	1.73E-05	1.73E-07	5.47E-05
Cerium oxide	all products	0%	4.67E-04	0	4.67E-05	4.67E-07	4.67E-09	1.48E-06
		95%	2.33E-05	4.43E-04	2.33E-06	2.33E-08	2.33E-10	7.38E-08
		97%	1.40E-05	4.53E-04	1.40E-06	1.40E-08	1.40E-10	4.43E-08
Ceramic	Coating	0%	3.67E+02	0	3.67E+01	3.67E-01	3.67E-03	1.16E+00
		97%	1.10E+01	3.56E+02	1.10E+00	1.10E-02	1.10E-04	3.48E-02
Encapsulates	all products	0%	1.41E+01	0	1.41E+00	1.41E-02	1.41E-04	4.45E-02
		97%	5.92E-01	1.35E+01	5.92E-02	5.92E-04	5.92E-06	1.87E-03
Iron oxide	Paint	0%	2.20E+02	0	2.20E+01	2.20E-01	2.20E-03	6.96E-01
		97%	6.60E+00	2.13E+02	6.60E-01	6.60E-03	6.60E-05	2.09E-02
Keratin	all products	0%	8.27E+01	0	8.27E+00	8.27E-02	8.27E-04	2.61E-01
		97%	2.48E+00	8.02E+01	2.48E-01	2.48E-03	2.48E-05	7.84E-03
Silazane	car polish	0%	1.00E+00	0	1.00E-01	1.00E-03	1.00E-05	3.16E-03
		97%	3.00E-02	9.70E-01	3.00E-03	3.00E-05	3.00E-07	9.49E-05
Silica	all products	0%	4.00E+02	0	4.00E+01	4.00E-01	4.00E-03	1.26E+00

type	application	removal WWTP	WWTP effluent ug/L	WWTP biosolids ug/L	WTP influent ug/L	WTP conventional ug/L	WTP membrane ug/L	WTP filtration ug/L
		97%	1.20E+01	3.88E+02	1.20E+00	1.20E-02	1.20E-04	3.79E-02
Silver	all products	0%	1.07E+02	0	1.07E+01	1.07E-01	1.07E-03	3.39E-01
		39%	6.54E+01	4.18E+01	6.54E+00	6.54E-02	6.54E-04	2.07E-01
		97%	3.21E+00	1.04E+02	3.21E-01	3.21E-03	3.21E-05	1.02E-02
Titanium oxide	all products	0%	1.64E+03	0.00E+00	1.64E+02	1.64E+00	1.64E-02	5.18E+00
		23%	1.26E+03	3.76E+02	1.26E+02	1.26E+00	1.26E-02	3.99E+00
		97%	4.91E+01	1.59E+03	4.91E+00	4.91E-02	4.91E-04	1.55E-01
Titanium oxide	Sunscreens	0%	1.05E+03	0	1.05E+02	1.05E+00	1.05E-02	3.32E+00
		23%	8.09E+02	2.42E+02	8.09E+01	8.09E-01	8.08E-03	2.56E+00
		97%	3.15E+01	1.02E+03	3.15E+00	3.15E-02	3.15E-04	9.96E-02
Zinc oxide	all products	0%	6.36E+02	0	6.36E+01	6.36E-01	6.35E-03	2.01E+00
		97%	1.91E+01	6.16E+02	1.91E+00	1.91E-02	1.91E-04	6.03E-02
Zinc oxide	Sunscreens	0%	4.50E+02	0	4.50E+01	4.50E-01	4.50E-03	1.42E+00
		97%	1.35E+01	4.37E+02	1.35E+00	1.35E-02	1.35E-04	4.27E-02

S8.2. Estimated concentrations in raw and treated drinking water as a measure of particle number concentration (#/L)

Type	application	removal WWTP	Particle size nm	WWTP effluent #/L	WWTP biosolids #/L	WTP influent #/L	WTP conventional #/L	WTP membrane #/L	WTP filtration #/L
Aluminium and aluminium oxide	all products	0%	50	7.30E+09	0	7.30E+08	7.30E+06	7.30E+04	2.31E+07
		0%	5000	7.30E+03	0	7.30E+02	7.30E+00	7.30E-02	2.31E+01
		97%	50	2.19E+08	7.08E+09	2.19E+07	2.19E+05	2.19E+03	6.92E+05
		97%	5000	2.19E+02	7.08E+03	2.19E+01	2.19E-01	2.19E-03	6.92E-01
C60	all products	0%	20	8.00E+10	0	8.00E+09	8.00E+07	8.00E+05	2.53E+08
		0%	80	1.25E+09	0	1.25E+08	1.25E+06	1.25E+04	3.95E+06
		79%	20	1.68E+10	6.32E+10	1.68E+09	1.68E+07	1.68E+05	5.32E+07
		79%	80	2.63E+08	9.88E+08	2.63E+07	2.63E+05	2.63E+03	8.31E+05
		97%	20	2.40E+09	7.76E+10	2.40E+08	2.40E+06	2.40E+04	7.59E+06
		97%	80	3.75E+07	1.21E+09	3.75E+06	3.75E+04	3.75E+02	1.19E+05
Cerium oxide	all products	0%	8	2.44E+08	0	2.44E+07	2.44E+05	2.44E+03	7.72E+05
		95%	8	1.22E+07	2.32E+08	1.22E+06	1.22E+04	1.22E+02	3.86E+04
		97%	8	7.32E+06	2.37E+08	7.32E+05	7.32E+03	7.32E+01	2.32E+04
Iron oxide	Paint	0%	10	8.13E+13	0	8.13E+12	8.13E+10	8.13E+08	2.57E+11
		97%	10	2.44E+12	7.88E+13	2.44E+11	2.44E+09	2.44E+07	7.71E+09
Silica	all products	0%	10	2.90E+14	0	2.90E+13	2.90E+11	2.90E+09	9.16E+11
		0%	1000	2.90E+08	0.00E+00	2.90E+07	2.90E+05	2.90E+03	9.16E+05
Silica	all products	97%	10	8.69E+12	2.81E+14	8.69E+11	8.69E+09	8.69E+07	2.75E+10
		97%	1000	8.69E+06	2.81E+08	8.69E+05	8.69E+03	8.69E+01	2.75E+04
Silver	all products	0%	25	1.25E+12	0	1.25E+11	1.25E+09	1.25E+07	3.95E+09
		0%	150	5.78E+09	0	5.78E+08	5.78E+06	5.78E+04	1.83E+07
		39%	25	7.62E+11	4.87E+11	7.62E+10	7.62E+08	7.62E+06	2.41E+09
		39%	150	3.53E+09	2.25E+09	3.53E+08	3.53E+06	3.53E+04	1.12E+07
		97%	25	3.75E+10	1.21E+12	3.75E+09	3.75E+07	3.75E+05	1.18E+08
		97%	150	1.73E+08	5.61E+09	1.73E+07	1.73E+05	1.73E+03	5.48E+05
Titanium oxide	sunscreens	0%	20	5.93E+13	0	5.93E+12	5.93E+10	5.93E+08	1.87E+11
		0%	70	1.38E+12	0	1.38E+11	1.38E+09	1.38E+07	4.37E+09
		23%	20	4.56E+13	1.36E+13	4.56E+12	4.56E+10	4.56E+08	1.44E+11
		23%	70	1.06E+12	3.18E+11	1.06E+11	1.06E+09	1.06E+07	3.37E+09
		97%	20	1.78E+12	5.75E+13	1.78E+11	1.78E+09	1.78E+07	5.62E+09
		97%	70	4.15E+10	1.34E+12	4.15E+09	4.15E+07	4.15E+05	1.31E+08

Type	application	removal WWTP	Particle size nm	WWTP effluent #/L	WWTP biosolids #/L	WTP influent #/L	WTP conventional #/L	WTP membrane #/L	WTP filtration #/L
Zinc oxide	sunscreens	0%	20	1.92E+13	0	1.92E+12	1.92E+10	1.92E+08	6.06E+10
		0%	200	1.92E+10	0	1.92E+09	1.92E+07	1.92E+05	6.06E+07
		97%	20	5.75E+11	1.86E+13	5.75E+10	5.75E+08	5.75E+06	1.82E+09
		97%	200	5.75E+08	1.86E+10	5.75E+07	5.75E+05	5.75E+03	1.82E+06

S9 Exposure comparison different routes

Products	No.	N.P	Sector	Nanomaterial Location	Rating F	Rating I	Δ Rating F - I
Business & Sports Socks	13	Ag	Clothing	suspended in solids	10	11	-1
Socks	63	Ag	Clothing	suspended in solids	6	7	-1
Socks	64	Ag	Clothing	suspended in solids	6	7	-1
Socks	65	Ag	Clothing	suspended in solids	10	11	-1
100% cotton clean-sheet	1	Ag	Clothing	suspended in solids	11	12	-1
Various Clothing Lines	94	Al	Clothing	suspended in solid	11	12	-1
A range of surface coatings and paints	3	Carbon	Paints & Coatings	suspended in liquid	8	9	-1
Self Cleaning Glass	55	TiO ₂	Paints & Coatings	suspended in liquid	9	12	-3
Water-based paints	29	Fe ₂ O ₃	Paints & Coatings	suspended in liquid	8	9	-1
Tiles	28	TiO ₂	Paints & Coatings	suspended in liquid	9	11	-2
Wipe	2	Ag	Cleaning	surface bound	11	12	-1
Fuel Borne Catalyst	22	CeO	Auto	suspended in liquid	10	10	0
Various Clothing Lines	92	SiO ₂	Clothing	surface bound	10	10	0
Various Clothing Lines	93	SiO ₂	Clothing	surface bound	10	10	0
Various Clothing Lines	95	SiO ₂	Clothing	Surface bound	10	10	0
Clear coat finish	15	Ceramic	Paints and Coatings	suspended in liquid	9	9	0
Various cosmetics including Complete All Day UV Moisture Lotion	99	ZnO	Cosmetics	suspended in liquid	7	7	0
Dry Waterless Wash	21	SiO ₂	Auto	suspended in liquid	10	8	2
		ZnO	Auto	suspended in liquid	10	8	2
Car Polish	25	ZnO	Auto	suspended in liquid	6	4	2

Products	No.	N.P	Sector	Nanomaterial Location	Rating F	Rating I	Δ Rating F - I
Various Polish/Wax	38	Silazane	Auto	suspended in liquid	10	8	2
		SiO ₂	Auto	suspended in liquid	10	8	2
		ZnO	Auto	suspended in liquid	10	8	2
Car polish range	41	SiO ₂	Auto	suspended in liquid	8	6	2
		ZnO	Auto	suspended in liquid	8	6	2
Polish/wax	42	SiO ₂	Auto	suspended in liquid	10	8	2
		ZnO	Auto	suspended in liquid	10	8	2
Car wax	72	SiO ₂	Auto	suspended in liquid	8	6	2
		ZnO	Auto	suspended in liquid	8	6	2
Bioclean	60	TiO ₂	Cleaning	surface bound	9	8	1
Algae Inhibitor	69	SiO ₂	Paints & Coatings	suspended in liquid	10	8	2
Cosmetics	34	SiO ₂	Cosmetics	suspended in liquid	11	9	2
Various cosmetics	96	SiO ₂	Cosmetics	suspended in liquid	5	3	2
Skin Repair System	126	SiO ₂	Cosmetics	suspended in liquid	9	7	2
Eye lift	5	Lipid	Cosmetics	suspended in liquid	11	8	3
Concealer	14	AlO	Cosmetics	suspended in liquid	11	8	3
Cosmetics	16	AlO	Cosmetics	suspended in liquid	10	8	2
	33	Lipid	Cosmetics	suspended in liquid	10	8	2
Various cosmetics	50	Lipid	Cosmetics	suspended in liquid	10	8	2
Various cosmetics	51	AlO	Cosmetics	suspended in liquid	10	8	2
Various cosmetics	97	lipid	Cosmetics	suspended in liquid	9	7	2
	33	C60	Cosmetics	suspended in liquid	11	9	2
	35	C60	Cosmetics	suspended in liquid	11	9	2
Various cosmetics	98	C60	Cosmetics	suspended in liquid	11	9	2
Various cosmetics	102	Ceramid	Cosmetics	suspended in liquid	11	(9)*	2

Products	No.	N.P	Sector	Nanomaterial Location	Rating F	Rating I	Δ Rating F - I
Fullerene C-60 Day Cream, Fullerene C-60 Eye Cream	125	C60	Cosmetics	suspended in liquid	11	9	2
Various cosmetics	101	Lipid	Cosmetics	suspended in liquid	10	8	2
Various Washing Machines	122	Ag	Home and Garden	surface bound	5	3	2
Washing Machine	123	Ag	Home and Garden	surface bound	9	7	2
Whitening Toothpaste	68	Calcium	Personal Care	suspended in liquid	7	6	1
Biorepair Toothpaste	12	SiO ₂	Personal Care	suspended in liquid	7	6	1
Various Sunscreens	108	TiO ₂	Personal Care	suspended in liquid	6	4	2
Various Sunscreens	109	TiO ₂	Personal Care	suspended in liquid	6	4	2
Various Sunscreens	110	ZnO	Personal Care	suspended in liquid	7	5	2
Various Sunscreens	114	TiO ₂	Personal Care	suspended in liquid	6	4	2
Various Sunscreens	115	ZnO	Personal Care	suspended in liquid	7	5	2
Various Sunscreens	117	ZnO	Personal Care	suspended in liquid	7	5	2
Various Sunscreens	119	ZnO	Personal Care	suspended in liquid	7	5	2
Facial Sun Defence Cream	67	TiO ₂ (Mn)	Personal Care	suspended in liquid	7	5	2
Various Sunscreens	116	ZnO	Personal Care	suspended in liquid	8	6	2
Various Sunscreens	118	ZnO	Personal Care	suspended in liquid	8	6	2
NutriNano CoQ10	66	CoEnzyme	Personal Care	suspended in liquid	10	7	3
Locking Mist	39	keratin	Personal Care	suspended in liquid	7	5	2
Nanofibers	39	keratin	Personal Care	suspended in liquid	7	5	2
Nanogaine	39	keratin	Personal Care	suspended in liquid	7	5	2
Nanoguard	39	keratin	Personal Care	suspended in liquid	7	5	2
Nanoscalp	39	keratin	Personal Care	suspended in liquid	7	5	2

Products	No.	N.P	Sector	Nanomaterial Location	Rating F	Rating I	Δ Rating F - I
Nanothick	39	keratin	Personal Care	suspended in liquid	7	5	2

* Where the concentration is 'unknown', a rating has been computed on the basis of using the score of 5 for the concentration element of the formula. N.S. Not Specified

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