



## Notes to SweRF calculation sheet:

Based on the effects in acute inhalation toxicity studies, a classification as acutely toxic via inhalation category 1 (H330) is applicable to the tested cobalt metal powder. It is reasonable to assume that all cobalt metal powders with similar potential for deposition in the pulmonary region of the respiratory tract would elicit similar effects and would require classification accordingly.

The Cobalt REACH Consortium has agreed to classify any cobalt powder containing 0.01% or more of respirable material and to use the following procedure in order to determine the respirable fraction of any cobalt powder:

In cases where a physical particle size distribution (i.e., by laser diffraction methods) is available, the use of a mathematical method as a means of expressing the content of respirable particles in bulk materials is suggested.

The method calculates the “Size Weighted Respirable Eraction” (SWeRF) of a bulk material. Based on the physical particle size distribution, a statistical weighting is applied (probability function given in EN 481, formula below), describing the probability of particles to reach the alveoli.

$$\text{SWeRF} = \int_{x=0}^{x=\infty} f(\text{psd})_x \times P(x) dx$$

$f(\text{psd})_x$  = particle size fraction for aerodynamic diameter  $x$ .

$P(x)$  = probability of reaching the alveoli for particles of aerodynamic diameter  $x$ , according to EN 481

$x$  = aerodynamic diameter =  $D \times \sqrt{SG}$ , where  $D$  is the physical diameter and  $SG$  is the specific gravity

Explanations on [how to use the Excel sheet](#) are provided on the following pages:

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**Notes to SweRF calculation sheet:**

**Which cells of the Excel sheet need to be filled out. What data do you need:**

Cumulative particle size distribution (PSD), i.e., by laser diffraction methods.

An example of a cumulative PSD and how it looks when entered into the Excel sheet is on the right: Particle size from small (top) to large (bottom). Replace the blue numbers in the yellow cells with your own results. Use only a cumulative size distribution.

Once you have entered your physical size distribution data in to columns C and D (starting at C9 and D9), the calculation result (EN 481) will appear in column E (starting at E9).

The density for Cobalt is already entered in cell J3 – this should be the same for all Co powders.

The result is shown in cell H4. Only powders with a value below 0.01% do not need to be classified as Acute Tox Cat 1 (inhalation).

	C	D	E
	Diameter (µm)	Cum. (%)	EN 481 (%)
9	0,48	0,00	95,5
10	0,55	0,14	94,4
etc	0,63	0,88	92,5
	0,72	2,67	89,5
	0,83	5,97	84,5
	0,96	11,06	77,2
	1,10	18,09	67,5
	1,26	26,91	55,7
	1,45	37,16	43,1
	1,66	48,25	30,8
	1,91	59,45	20,3
	2,19	70,01	12,1
	2,51	79,29	6,6
	2,88	86,84	3,3
	3,31	92,49	1,5
	3,80	96,38	0,6
	4,37	98,74	0,2
	5,01	99,83	0,1
	5,75	100,00	0,0
	6,60	100,00	0,0
	7,59	100,00	0,0
	8,71	100,00	0,0
	10,00	100,00	0,0
	11,48	100,00	0,0
	13,18	100,00	0,0
	15,14	100,00	0,0
	17,38	100,00	0,0
	19,95	100,00	0,0
	22,91	100,00	0,0
	26,30	100,00	0,0

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## Notes to SWeRF calculation sheet:

### Some cells of the Excel sheet need to be ignored:

The cells to the right of column "O" do not need to be filled out, and can be ignored for the purpose of the SWeRF calculation of Co powders (the cells beyond "O" refer to a sedimentation technique used for the SWeRF calculation of crystalline silica)

Also, these cells are not needed for the Co SWeRF calculation and can be left empty:

L2	M2	N2
L3	M3	N3
L4	M4	N4

The red text in F50, I50 through 52 can be ignored, as it only pertains to the sedimentation curve. Sedimentation data are not entered for the Co SWeRF calculation.

This document was prepared by Cobalt REACH Consortium Secretariat.

For further information please contact: [REACHinfo@thecdi.com](mailto:REACHinfo@thecdi.com)

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