



Risk Evaluation Determining Whether Environmental Emergency Planning is Required Under the
Environmental Emergency Regulations set under the
Canadian Environmental Protection Act, 1999
(CEPA 1999)

Nickel Chloride (CAS #: 7718-54-9)
(Oxidic, Sulphidic, and Soluble Inorganic Nickel Compounds)
(CEPA, 1999 – Schedule 1, #42)

Summary of Risk Evaluation Analysis

The Risk Evaluation Framework (REF), developed by Environment Canada, is applied to chemical substances in order to determine whether or not an environmental emergency (E2) plan should be required. For those substances that are evaluated as requiring an E2 plan, the next step is to determine a threshold quantity for the total quantity of the substance and the maximum storage container size on site. Within the REF, three categories are used to evaluate chemicals and assign threshold quantities. Shown below are the details within the three categories for *nickel chloride*:

1. Environmental Hazard

(Persistence, Bioaccumulation and Aquatic Toxicity Analysis)

- According to Mackay *et al.* (2003), nickel, chromium, arsenic, and cadmium are classified as indefinitely persistent. As a result, *nickel chloride* is also classified as indefinitely persistent in the environment.
- No data are available to determine the bioaccumulative potential.
- For aquatic toxicity, it was determined that *nickel chloride* is moderately toxic (LC₅₀ at 96 hrs between 1 and 10 mg/L) based on the most sensitive species, fathead minnow (Schubauer-Berigan *et al.*, 1993).

2. Human Hazard

(Inhalation Toxicity and Carcinogenicity Analysis)

- Since *nickel chloride* has a vapour pressure below 1.33 kPa at 20°C (HSDB, 2004; Genium, 2004), there is insufficient vapour from the substance to cause an inhalation problem.
- *Nickel chloride* is categorized as an International Agency for Research on Cancer (IARC) carcinogen with a classification rating of '1' (HSDB, 2004; ATSDR, 2003; IARC, 1990; Genium, 2004).

3. Physical Hazard

(Flammability and Combustibility Analysis)

- *Nickel chloride* is a substance normally stable, even under fire exposure conditions, and is not reactive to water (Genium, 2004).

Flammability and Combustibility Analysis Table

	Value	Vapour Cloud Explosion (Yes/No)	Combustible (Yes/No)	References
Boiling point (°C)	Sublimes at 973	No	No	(HSDB, 2004; ATSDR, 2003; Bingham <i>et al.</i> , 2001; Genium, 2004)
Flash point (°C)	Non-flammable			(HSDB, 2004; ATSDR, 2003)

Threshold

The data from the above mentioned categories were used to determine the various environmental/human thresholds. The threshold quantities relate to: carcinogenicity, aquatic toxicity, inhalation toxicity, vapour cloud explosion, combustibility, and reactivity.

The threshold quantity for carcinogenicity is defaulted to 0.22 tonnes, if it meets the following criteria:

- 1) have an IARC rating of 1, 2A or 2B, or have a US EPA rating of A, B1, or B2;
- 2) be persistent in any media for greater than 5 years.

Threshold quantities assigned as a result of aquatic toxicity are based on the following table:

Threshold Quantities Assigned as a Result of Aquatic Toxicity

Criteria	Extremely Toxic	Highly Toxic	Moderately Toxic	Slightly Toxic
Persistence (water)	≥ 6 months	≥ 2 months to < 6 months	N/A	N/A
Bioaccumulation	BCF ≥ 5000 or Log Kow ≥ 5	BCF ≥ 500 to < 5000 or Log Kow ≥ 4 to < 5 (unless BCF < 500)	N/A	N/A
Acute Aquatic Toxicity (96 hrs LC ₅₀ – mg/L)	≤ 0.1	> 0.1 to ≤ 1	> 1 to ≤ 10	> 10 to ≤ 100
Threshold Quantity Tonnes (lbs)	0.22 (500 lbs)	1.13 (2 500 lbs)	4.50 (10 000 lbs)	9.10 (20 000 lbs)

A substance is a candidate for a vapour cloud explosion if its flash point is < 23°C and its boiling point is < 35°C. A substance is considered combustible if its flash point is < 23°C or its boiling point is < 35°C. In accordance with the precautionary principle, the category with the lowest threshold will be used. For further explanation, please refer to the *Implementation Guidelines for Part 8 of the Canadian Environmental Protection Act, 1999 – Environmental Emergency Plans* (<http://www.ec.gc.ca/ee-ue/>).

Conclusion

For *nickel chloride* # 42, the E2 hazard threshold was triggered by:

- 1) Aquatic toxicity at 0.22 tonnes;
- 2) Carcinogenicity at 0.22 tonnes.

Therefore, *nickel chloride* # 42 is recommended for addition to Schedule 1 of the *Environmental Emergency Regulations* under Part 3 with a threshold quantity of 0.22 tonnes.

References

ATSDR (Agency of Toxic Substances for Disease Registry). *Toxicological Profile for Nickel CAS # 7440-02-0*. PB/98/101199/AS. 2003. World Wide Web accessed on October 2004.

<http://www.atsdr.cdc.gov/toxprofiles/tp.asp?id=245&tid=44>

Bingham, E., B. Cohrssen, and C. Powell, (editors). *Patty's Toxicology*. 5th Edition. Wiley-Interscience Publication. John Wiley & Sons Inc. New York, NY. 2001. Volume 3. pp. 195-219.

Genium. "Material Safety Data Sheet – Nickel (II) Chloride". Release 58. CD-ROM. Genium Publishing Corp. Schenectady, NY. 2004.

HSDB (Hazardous Substances Data Bank). *Nickel Chloride*. Canadian Centre for Occupational Health and Safety. U.S. National Library of Medicine. 2004. World Wide Web accessed October 2004.

<http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB>

IARC (International Agency for Research on Cancer). *Nickel and Nickel Compounds*. World Health Organization. 1990. World Wide Web accessed September 2004.

<http://monographs.iarc.fr/ENG/Monographs/vol49/mono49-7.pdf>

Mackay, D., E. Webster, D. Woodfine, T.M. Cahill, P. Doyle, Y. Couillard, and D. Gutzman. "Contributed Articles Towards Consistent Evaluation of the Persistence of Organic, Inorganic and Metallic Substances." 2003. ASP. Canadian Environmental Modelling Centre and Environment Canada. *Human and Ecological Risk Assessment*. 9: 1445-1474. ISSN: 1080-7039.

Schubauer-Berigan, M.K., J.R. Dierkes, P.D. Monson, and G.T. Ankley. "pH-Dependent Toxicity of Cd, Cu, Ni, Pb and Zn to *Ceriodaphnia dubia*, *Pimephales promelas*, *Hyalella azteca* and *Lumbriculus variegatus*." 1993. *Environ. Toxicol. Chem.* 12:1261-1266.

Cat. No.: En14-55/18-2011E-PDF

ISBN: 978-1-100-19707-4

For information regarding reproduction rights, please contact Public Works and Government Services Canada at 613-996-6886 or at droitdauteur.copyright@tpsgc-pwgsc.gc.ca

© Her Majesty the Queen in Right of Canada, represented by the Minister of the Environment, 2011

Aussi disponible en français