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

Cadmium Sulphide (CAS #: 1306-23-6)
(Inorganic Cadmium Compounds)
(CEPA, 1999 – Schedule 1, #31)

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 *cadmium sulphide*:

1. Environment 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, *cadmium sulphide* is also classified as indefinitely persistent in the environment.
- There is insufficient data at this time to classify the bioaccumulation of *cadmium sulphide*. In many cases, the current state of the science does not allow for the unambiguous interpretation of the bioaccumulation criterion for metal-containing inorganic substances (Environment Canada, 2003).
- For aquatic toxicity, it was determined that *cadmium sulphide* is highly toxic (LC₅₀ at 96 hrs between 0.1 and 1 mg/L) based on the most sensitive species, fathead minnow (Gale *et al.*, 1992).

2. Human Hazard

(Inhalation Toxicity and Carcinogenicity Analysis)

- No data are available to determine inhalation toxicity (Lewis, 2000; HSDB, 2004).
- *Cadmium sulphide* is categorized as a United States Environmental Protection Agency (US EPA) carcinogen with a classification rating of 'B1' (Genium, 2004; IRIS, 1987) and as an International Agency for Research on Cancer (IARC) carcinogen with a classification rating of '1' (Genium, 2004; IARC, 1993).

3. Physical Hazard

(Flammability and Combustibility Analysis)

- *Cadmium sulphide* is considered stable. *Cadmium sulphide* is not considered to be a significant fire risk (Genium, 2004).

Flammability and Combustibility Analysis Table

| | Value | Vapour Cloud Explosion (Yes/No) | Combustible (Yes/No) | References |
|--------------------|---------|---------------------------------|----------------------|---|
| Boiling point (°C) | No Data | No | No | (Genium, 2004; HSDB, 2004; Lewis, 2000) |
| Flash point (°C) | No Data | | | (Genium, 2004; ATSDR, 1999) |

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 *cadmium sulphide* # 31, the E2 hazard threshold was triggered by:

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

Therefore, *cadmium sulphide* # 31 is recommended for addition to Schedule 1 of the *Environmental Emergency Regulations* under Part 3 with a threshold quantity of 0.22 tonnes.

References

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