

**Substance Risk Evaluation for Determining Environmental Emergency Planning
under the *Environmental Emergency Regulations* Set under the
*Canadian Environmental Protection Act, 1999 (CEPA 1999)***

**Vanadium pentoxide
Vanadium(V) oxide (CAS No. 1314-62-1)**

Risk Evaluation Conclusion:

- **Threshold Quantity of 0.22 tonnes (concentration 1%) due to aquatic toxicity and other considerations**
- **Is a candidate for the *Environmental Emergency Regulations***

1.0 INTRODUCTION

The *Environmental Emergency Regulations*, developed under Part 8 of the *Canadian Environmental Protection Act (CEPA)*, 1999 (Government of Canada, 2011), establish a list of substances for which fixed facilities must notify Environment Canada that they store or use the substance on-site, by providing notices to Environment Canada, reporting when the substance is released into the environment, and developing an environmental emergency plan (E2 plan) for each substance stored or used at a fixed facility at or above specified threshold quantities.

To determine if a substance is a candidate to be added to the *Environmental Emergency Regulations*, Environment Canada has developed a risk evaluation methodology based on the following hazard categories:

- Physical: flammable and combustible or oxidizing substances, or those having a potential to cause vapour cloud explosions or pool fires.
- Human Health: substances that are toxic by inhalation, are carcinogenic, or are corrosive.
- Environmental Health: substances that are: corrosive, persistent, bioaccumulative, or aquatically toxic.

For more information on the methodology for setting threshold quantities in the *Environmental Emergency Regulations*, please refer to Environment Canada (2014).

Vanadium pentoxide (CAS No. 1314-62-1) was selected for risk evaluation because it is a substance (under the Government of Canada's Chemicals Management Plan [<http://www.ec.gc.ca/ese-ees/default.asp?lang=En&n=62A2DBA9-1>]) that, if spilled, could be immediately harmful to humans and/or the environment.

Following the risk evaluation, Environment Canada recommends that this substance be proposed for addition to Schedule 1 of the *Environmental Emergency Regulations* at a threshold quantity of 0.22 tonnes.

2.0 SUMMARY OF THE RISK EVALUATION

2.1 Physical Hazard: Flammable, Combustible or Oxidizing Substances

Because vanadium pentoxide does not have an identified flash point (no flash point data were available during the data gathering process) and decomposes before reaching its boiling point of 1750°C (MSDS, 2008), this substance does not present the possibility of a vapour cloud explosion. Therefore, no threshold is set for this substance as a result of its potential for flammability or combustibility.

2.2 Physical Hazard: Potential for Pool Fires

It has been demonstrated via the Process Hazard Analysis Software Tools (PHAST) software that vanadium pentoxide is not capable of causing a pool fire.

2.3 Human Health Hazard: Inhalation Toxicity

Because vanadium pentoxide does not have a vapour pressure greater than 10 mmHg (1.33 kPa) at 25°C (Bingham, *et al.*, 2001), the substance does not have sufficient volatility to constitute an inhalation danger.

Therefore, no threshold is set for the inhalation toxicity to humans.

2.4 Human Health Hazard: Carcinogenicity

Because vanadium pentoxide is classified in group 2b of IARC (IARC, 2008), and because the substance is indefinitely persistent in any medium, a threshold of 0.22 tonnes is set for the carcinogenicity of this substance.

2.5 Human and Environmental Health Hazard: Corrosive Substances

The measured pH is greater than 2 or less than 11.5, the substance is not considered corrosive and there is no associated threshold with this category.

2.6 Environmental Health Hazard: Persistent, Bioaccumulative, or Aquatically Toxic

Lethal concentration

The acute (short-term) aquatic toxicity for vanadium pentoxide has been determined to be slightly toxic based on studies of the most sensitive species, razorback sucker (Juvenile) (*Xyrauchen texanus*), with a lethal concentration (LC₅₀ 96 hours) of 10.771 mg/L (Hamilton, 1995). However, since the substance is indefinitely persistent in water, the threshold has been re-classified as extremely toxic, at 0.22 tonnes.

Persistence

Vanadium pentoxide is classified as being indefinitely persistent in water.

Bioaccumulation

Vanadium pentoxide is practically non-bioaccumulative.

Threshold

Following the evaluation of the aquatic toxicity, the threshold is set at 0.22 tonnes.

2.7 Assigned Threshold

Following the risk evaluation methodology developed under section 200 of CEPA 1999, the categories (flammability, combustibility, oxidizers, inhalation toxicity, aquatic toxicity, carcinogenicity, corrosiveness, pool fires) having the lowest scientific threshold will be compared against other risk management considerations. For example, the threshold will be compared to other provincial and federal legislation or voluntary programs that may already provide adequate management of the risk from an environmental emergency. Proposed thresholds may also be modified based on policy and other considerations as assessed during the preliminary public consultation period. For more information regarding the determination of thresholds, please refer to the *Implementation Guidelines for the Environmental Emergency Regulations 2011* (Environment Canada, 2011).

Other Considerations

At this time, there are no other considerations to take into account for this substance that would result in an increase or a decrease in the calculated threshold quantity.

Findings

A proposed threshold of 0.22 tonnes is assigned for vanadium pentoxide based on its assessed carcinogenicity, aquatic toxicity, and for the fact that this substance is indefinitely persistent. The threshold quantity and its respective concentration will not be finalized until after preliminary public consultation.

3.0 CONCLUSION

Information concerning the quantities of vanadium pentoxide (CAS No. 1314-62-1) in use in Canada indicates that the substance exists in commerce. Following the risk evaluation of vanadium pentoxide and taking into consideration the quantities in use in Canada, Environment Canada recommends that this substance be proposed for addition to Schedule 1 of the *Environmental Emergency Regulations* under CEPA 1999 at a threshold quantity of 0.22 tonnes at a concentration of 1%.

When doing the emergency planning of a substance, it is important to take into consideration not only the most stringent assigned threshold quantity, but all of the other higher-threshold quantities that are noted in association with this substance. Other notable thresholds of concern also determined for this substance are: 0.22 tonnes for aquatic toxicity.

Even if the quantity of a substance in use is below the threshold quantity indicated in the *Environmental Emergency Regulations*, Environment Canada recommends that

emergency planning be applied to this substance in order to minimize, or prevent, any impacts on humans or the environment in the event of a release of the substance.

4.0 REFERENCES

Bingham, E, B Cohrssen, and C Powell. 2001. Patty's Toxicology. 5th Edition. Wiley-Interscience Publication. John Wiley & Sons Inc. Volume 2. p 68. New York, NY.

Environment Canada. 2011. Implementation Guidelines for the Environmental Emergency Regulations 2011. Available from:
<http://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=1FB6D405-1>

Environment Canada. 2014. Summary of Risk Evaluation Framework for Determining Quantity Thresholds and Concentrations for Substances under the Environmental Emergency Regulations Set under the Canadian Environmental Protection Act, 1999 (CEPA 1999). Environment Canada. Available from:
<http://www.ec.gc.ca/ee-ue/default.asp?lang=En&n=9605FFBD-1>

Government of Canada. 2011. Environmental Emergency Regulations, Canadian Environmental Protection Act, 1999. Environment Canada. Registered on December 8, 2011. Available from:
<http://www.gazette.gc.ca/rp-pr/p2/2011/2011-12-21/html/sor-dors294-eng.html>

Hamilton S. 1995. Hazard assessment of inorganics to three endangered fish in the Green River. Utah. Ecotoxicology and environmental safety. 30:134-142.

IARC (International Agency for Research on Cancer). 2008. Volume 86. Cobalt in Hard Metals and Cobalt Sulfate, Gallium Arsenide, Indium Phosphide and Vanadium Pentoxide. Summary of Data Reported and Evaluation. Available from:
http://monographs.iarc.fr/search.php?cx=009987501641899931167%3A2_7lsevqpdm&c of=FORID%3A9&ie=UTF-8&ie=ISO-8859-1&oe=ISO-8859-1&sa=&q=1314-62-1#gsc.tab=0&gsc.q=1314-62-1&gsc.page=1

MSDS (Material Safety Data Sheets). Vanadium oxide. 2008. In: Canadian Centre for Occupational Health and Safety (CCOHS). Available from:
<http://ccinfoweb.ccohs.ca/msds/search.html>

5.0 FURTHER READING

Ketcheson K, Shrives J. 2010. Comparison of Threshold Quantities for Substances with Final AEGL-2 and IDLH Values under CEPA's Environmental Emergency Regulations. In: Proceedings of the Thirty-third Arctic and Marine Oilspill Program Technical Seminar on Environmental Contamination and Response. Environment Canada: Ottawa (ON). pp. 843-861.

U.S. EPA (U.S. Environmental Protection Agency). 1994. List of Regulated Toxic and Flammable Substances and Thresholds for Accidental Release Prevention. Federal

Register, 59(20). Document Number 94-1556. 31. Washington (DC). Available from :
<http://www.gpo.gov/fdsys/pkg/FR-1994-01-31/html/94-1556.htm>