MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

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INTEROFFICE COMMUNICATION

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TO: File for Pentapotassium bis(peroxymonosulphate) bis(sulphate) (CAS # 70693-62-8)

FROM: Keisha Williams, Air Quality Division

DATE: October 3, 2018

SUBJECT: Screening Level for Pentapotassium bis(peroxymonosulphate) bis(sulphate)

The initial threshold screening level (ITSL) for acute exposure to pentapotassium bis(peroxymonosulphate) bis(sulphate) (KMPS) is 35 µg/m^3 (8-hour averaging time) based on the Michigan Department of Environmental Quality (MDEQ), Air Quality Division (AQD) Rule 336.1233.

The following references or databases were searched to identify data to determine the screening level: United States (EPA's) Integrated Risk Information System (IRIS), the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV), National Institute of Occupational Safety and Health (NIOSH) Pocket Guide to Hazardous Chemicals, Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Levels, International Agency for Research on Cancer (IARC) Monographs, Health Effects Assessment Summary Tables (HEAST), National Toxicology Program (NTP) Status Report, EPA Superfund Provisional Peer Reviewed Toxicity Values, EPA Acute Exposure Guideline Levels (AEGLs) for Airborne Chemicals, EPA High Production Volume Database, United States Department of Labor Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs), Spacecraft Maximum Allowable Concentrations (SMACs), California Office of Environmental Health Hazard Assessments Reference Exposure Levels, Texas Commission on Environmental Quality (TCEQ) Effects Screening Levels (ESLs), and European Chemicals Agency Registered Substances Dossiers.

Background Information

KMPS (Figure 1) has been used in aluminum processing and has a pesticide. Chemical properties are listed in Table 1.

Figure 1. Chemical structure for KMPS

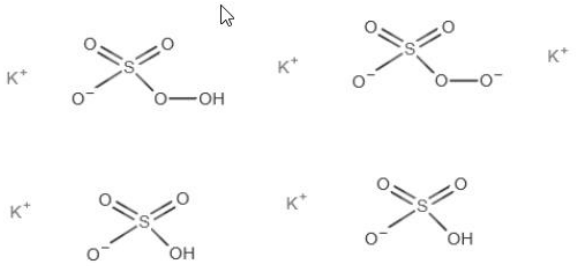

Table 1. Chemical and physical properties for KMPS

Molecular weight: 614.7597 grams/mole
Melting point: N/A; decomposes at 250°C before melting
Boiling point: N/A; decomposes before boiling
Vapor pressure: <1.7 x 10^{-4} mmHg at 25°C
Physical state: solid
Color: white

Reference: ECHA, 2016

KMPS is known to be irritating and corrosive, and to exhibit portal of entry effects. This has been shown in both controlled human studies and rodent studies (ECHA, 2016). Very little information is known about its toxicity otherwise.

The only controlled human studies available are dermal studies (ECHA, 2016). Although they provide evidence for the irritancy of KPMS, they are not otherwise relevant for inhalation screening level derivation.

Evaluation of Cancer Risk

There are no epidemiological studies or *in vivo* studies to evaluate the carcinogenicity of KMPS. Because of the lack of information on KMPS-induced carcinogenicity, KMPS will not be regulated as a carcinogen at this time.

Review of Relevant Studies for Non-carcinogen Effects

Two inhalation studies in rodents were found (ECHA, 2016; Dupont, 1981). One study was a lethal dose finding study, where the LC50 was estimated to be 1850 mg/m^3 with a 4-hour exposure in 7-10-week-old male and female, Crl:CD BR rats. The other study was a 2-week inhalation exposure study in 8-week-old male, Crl:CD rats.

<u>Key Study for Acute ITSL Derivation</u>

As summarized by the European Chemical Agency, 8-week-old male, Crl:CD rats (N=10) were exposed (head only) to 0, 1.4, 10.1, or 43.1 mg/m^3 for 6 hours per day, for 5 days per week, for 2 weeks (ECHA, 2016). Animals were examined daily (except on weekends) during the exposure period and the subsequent 13-day observation period for clinical signs and mortality. Body weights were also taken daily. Groups were divided in half and necropsied at two different times, where hematology and clinical chemistry were performed after the 10th exposure and the 13th day of the subsequent observation period, respectively. All animals underwent gross pathology and select organs were weighed. A no observable effect level (NOEL) was found at

1.4 mg/m^3. Adverse effects observed at doses above this, and in a dose-related fashion, during the exposure period included “clinical observations [that] were those characteristic of eye irritation” (Dupont, 1981). Adverse effects that continued following the 13-day observation period included weight loss, and eye irritation as seen with alopecia around the eye, conjunctival swelling, corneal ulceration and hemorrhage, corneal vascularization, and clear discharge from the eye.

Typically, with a 2-week inhalation study, AQD Rule 336.1232 (1) (d) would be used to derive a chronic ITSL. However, it was noted that “during the exposure period clinical observations were severe ocular irritation at the mid and high dose levels.” With the clinical observations each work day, this identifies the need for an acute ITSL. In light of the irritation and acute effects observed in both the key study and controlled human studies, an acute ITSL is being derived to prevent spikes that may otherwise occur with an annual averaging time.

Benchmark Dose Modeling is not appropriate to use to determine a point of departure, because the eye irritation is best described as dichotomous data and occurred in all animals exposed above the lowest dose. Based off of the NOEL, an acute ITSL could be derived as shown in Equation 1.

Equation 1.

$$ITSL = \frac{POD}{UF_h x\ UF_A x\ UF_L}\ x\ \frac{hours\ exposed}{AT}$$

Where:

POD = Point of Departure. The POD=the NOEL at 1400 µg/m^3.

UF_H = 10 to account for average human to sensitive human variability

$UF_A = 10^{0.5}$ (≈3) for animal to human toxicodynamic extrapolation, given that dosimetry and toxicokinetic extrapolation is not necessary with portal of entry effects (EPA, 2002)

UF_L = 1 for LOAEL to NOAEL extrapolation since the NOAEL is the POD

AT = Averaging time of 1,8 or 24 hours. 8 hours will be used for the reasons described below.

$$ITSL = \frac{1400}{10\ x\ 3\ x\ 1}\ x\ \frac{6\ hours}{8\ hours} = 35\ \frac{\mu g}{m^3}, 8\ hour\ averaging\ time$$

It is not clear at what exposure duration the ocular effects started during the exposure period, and therefore further discussion is provided here as to the rationale for averaging time selection. Daily observations are referenced, but since the exposure period was 6 hours, the 8-hour averaging time is more relevant to the daily exposure period. Considerations were also made as to whether a 1-hour or an 8-hour averaging time was most appropriate, considering that portal of entry irritancy is expected to be dose-dependent regardless of exposure duration. It is important to note that the measures typically used to describe irritation in a rodent study, changes in respiration rate and eye blinking frequency, were not described in this study (OEHHA, 2008; Dupont, 1981). However, the clinical observations including eye closures and eye hemorrhaging, indicate severe eye irritation.

After the 13-day observation period, it was “not expected that complete recovery would occur.” This suggests that the ocular effects at these exposure concentrations might be classified as strong irritant-induced tissue damage. As described by the Office of Environmental Health Hazard Assessment (OEHHA, 2008), trigeminally-transmitted sensory irritation endpoints can be considered “independent of the duration of exposure over the one-hour timescale, unless data indicate such time dependence…Higher concentrations may cause irritation through tissue damage, and thus show time dependence because of accumulating tissue damage…the tissue damage resulting from exposure to these chemicals may be both time and concentration dependent and in some cases be dependent on the total cumulative dose or the concentration.” As a result of the tissue damaging nature of this exposure concentration, the 8-hour averaging time is most appropriate for ITSL derivation and a duration adjustment will be used to extrapolate from a 6-hour exposure to 8 hours.

Therefore, the acute ITSL is 35 μg/m^3, 8-hour averaging time.

References

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