MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

INTEROFFICE COMMUNICATION

TO: File for Cinquasia Red (CAS # 1047-16-1)

FROM: Doreen Lehner, Toxics Unit, Air Quality Division

DATE: June 10, 2024

SUBJECT: Screening Level Derivation for Cinquasia Red (CAS # 1047-16-1)

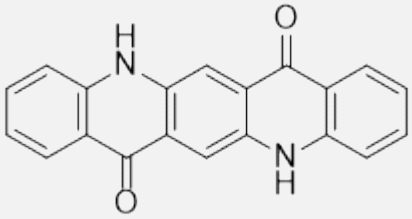
Summary

An initial threshold screening level (ITSL) will not be established due to the lack of sufficient toxicity data. This compound is a solid with relatively low oral toxicity and therefore, emissions may be evaluated based on the National Ambient Air Quality Standards (NAAQS) for particulate matter less than or equal to 2.5 microns ($PM_{2.5}$).

Uses and Physical Chemical Properties

Cinquasia red is an organic heterotetracyclic compound an organonitrogen heterocyclic compound that is a red, magenta, or violet quinacridone pigment that provides color, strength, and durability, and is used in materials that are exposed to light, weather, heat, and other chemicals. Cinquasia red is used in inkjet inks and electrophotographic toners; in plastics, including plastics used in contact with food; as a colorant for paper and paperboard; in paints; rubber; textiles; nitrocellulose; vinyl; in hair dye; in the automotive and general industrial applications such as coil coatings; baking finishes; water-based acrylic/isocyanate; acid-curable; and air-drying finishes.

Table 1. Physical/Chemical Properties of Cinquasia Red

Structure	
CAS Number	1047-16-1
Synonyms	5,7,12,14-Tetrahydro-5,12-diazapentacene-7,14-dione; 5,12-dihydroquinolino[2,3-b]acridine-7,14-dione; Quinacridone; C.I. Pigment Violet 19

Appearance/Odor	Orange to amber to dark red to violet odorless solid nanomaterial with a bluish or yellowish tint. Particles are in the form of thin plates.
Molecular Weight	312.3 g/mol
Melting Point	390°C
Boiling Point	568.5°C at 760 mmHg
Flash Point	221.3°C
Autoignition Temperature	310°C
Solubility: Water	0.808 mg/L at 20°C
Density	1.371 g/cm^3 at 20°C
Vapor Pressure	< 1.0 x 10^{-10} mm Hg at 25°C (estimated)
Log K_{ow}	2.12
Henry's Law Constant	8.63 x 10^{-13} atm-m^3/mol (estimated)

Literature Search

The literature was searched to find relevant data to assess the toxicity of cinquasia red. The following references or databases were searched: U.S. Environmental Protection Agency (EPA) Integrated Risk Information System (IRIS), Registry for Toxic Effects of Chemical Substances (RTECS), American Conference of Governmental and Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs), National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Levels (RELs), International Agency for Research on Cancer (IARC) Monographs, Chemical Abstract Service (CAS) SciFinder (searched 5/7/2024), U.S. EPA ChemView, California Office of Environmental Health Hazard Assessment (OEHHA), the U.S. Department of Health and Human Services Agency for Toxic Substances and Disease Registry (ATSDR), European Chemical Agency (ECHA), and the U.S. National Toxicology Program (NTP).

Key Study

Inhalation toxicity data is scant, but there is a lowest lethal concentration (LC_{50}) for cinquasia red in air for rats of > 3,100 mg/m^3 (4-hour exposure time) (ECHA, 2023). This information can be used to determine a potential ITSL using the Rule 232(1)(f) equation below:

$$potential\ ITSL = \frac{LC_{50}}{500 \times 100} = \frac{3{,}100\ {}^{mg}/_{m^3}}{500 \times 100} = 0.062\ {}^{mg}/_{m^3} = 62\ {}^{\mu g}/_{m^3}$$
$$\approx 60\ {}^{\mu g}/_{m^3}\ (annual\ averaging\ time)$$

Cinquasia red is an irritant and has caused sensitivity when used in tattoos and markers that encounter the skin (NIH, 2024). Even though dermal studies are not evaluated for

an air toxicity value, skin irritation supports the assumption that this chemical will cause lung irritation when inhaled.

"Fischer 344 rats (number/sex/dose not specified) were administered C.I. Pigment Violet 19 (purity 97.3%) in the diet at 0, 1, 5, or 10% in feed (approximately 0, 1050, 5260, or 10500 mg/kg-bw/day[1]) for 33 days. No mortality was observed. A 10% increased food intake and body gain were observed. All animals exposed to the test substance had purple-tinged fur. No other clinical signs were observed. A slight increase in methemoglobin levels was seen in females at 10% during week 2, but not at week 4, and was not considered to be related to exposure. Clinical pathology, ophthalmology, cytogenetic analysis, organ weights and gross and tissue morphology examinations results did not indicate toxicity associated with the test substance. NOAEL ~ 10,500 mg/kg-bw/day (based on no treatment-related effects at the highest dose tested)" (EPA, 2015).

The rat oral study NOAEL can be used to determine a potential ITSL using the Rule 232(1)(e) equation below:

$$potential\ ITSL = \frac{NOAEL\ ({}^{mg}/_{kg/day})}{35\ \times 100} \times \frac{W_A}{I_A} \times \frac{b}{a}$$

W_A is the weight of a non-gender Fischer 344 rat in kg (0.305 kg). I_A is the daily inhalation rate of a Fischer 344 rat in cubic meters/day, ***b*** is the absorption efficiency by the oral route of exposure and ***a*** is the absorption efficiency by the inhalation route of exposure. Since, the absorption efficiencies of cinquasia red are not known the values for ***b*** and ***a*** are 1. Before determining the potential ITSL, the value of I_A must be ascertained using the following equation taken from EPA (1988):

$$I_A\left({}^{m^3}/_{day}\right) = 0.80\ \times\ W^{0.8206} = 0.80\ \times 0.305^{0.8206} = 0.301930117\ {}^{m^3}/_{day}$$

Using the daily inhalation rate calculated above, with the NOAEL of 10,500 mg/kg-bw/day into the potential ITSL equation above:

$$potential\ ITSL = \frac{10{,}500\ {}^{mg}/_{kg-bw/day}}{35\ \times 100} \times \frac{0.305\ kg}{0.301930117\ {}^{m^3}/_{day}} \times \frac{1}{1}$$

$$= 3.030502586\ {}^{mg}/_{m^3} = 3{,}030.502586\ {}^{\mu g}/_{m^3}$$

$$\approx 3{,}000\ {}^{\mu g}/_{m^3}\ (annual\ averaging\ time)$$

The oral study results show that the potential ITSL would be greater than the toxicity caused by inhalation exposure to cinquasia red. The inhalation study, however, was an acute LC_{50} study. Both the LC_{50} study and the oral study would not be considered health protective as cinquasia red is a nanoparticulate. It would be more appropriate to

use the NAAQS for particulate matter 2.5 microns and smaller in lieu of an ITSL. Therefore, as long as the ambient impact of cinquasia red combined with other particulate matter is below the $PM_{2.5}$ NAAQS, adverse health effects would not be expected to occur.

References:

Act 451 of 1994, Natural Resources and Environmental Protection Act and Air Pollution Control Rules, Michigan Department of Environment, Great Lakes, and Energy.

ECHA. 2023. European Chemicals Agency. Registration Dossier for 5,12-dihydro-quino[2,3-b]acridine-7,14-dione CAS Number: 1047-16-1. Accessed on 5/5/2024. Available online at: Substance Information - ECHA (europa.eu)

EPA. 1988. Recommendation for and documentation of biological values for use in Risk Assessment. Environmental Criteria and Assessment Office, Office of Health and Environmental Assessment, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, OH 45268. PB 88-179874. EPA/600/6-87/008.

EPA. 2015. U.S. Environmental Protection Agency Hazard Characterization Document. Screening-Level Hazard Characterization. C.I. Pigment Violet 19, C.I. Pigment Red 122 and Dihydroquinacridone Category. September, 2015. Available online at: ChemView | US EPA

NIH. 2024. Compound Summary Quinacridone. National Library of Medicine. National Center for Biotechnology Information. National Institutes of Health. Accessed on 6/6/2024. Available online at: Quinacridone | C20H12N2O2 | CID 13976 - PubChem (nih.gov)

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