**Michigan Department of Environmental Quality**

**Interoffice Communication**

TO: File for Yttrium (CAS # 7440-65-5)

FROM: Doreen Lehner, Toxics Unit, Air Quality Division

SUBJECT: Screening Level for Yttrium (CAS # 7440-65-5)

DATE: September 8, 2011

The initial threshold screening level (ITSL) for yttrium (CAS # 7440-65-5) is 10 µg/$m^3$ based on an 8-hour averaging time.

Yttrium (CAS # 7440-65-5) is a chemical element with symbol Y and atomic number 39. It is a silvery-metallic transition metal and is never found in nature as a free element. It's only stable isotope, $^{89}Y$ is also the only naturally-occurring isotope. At least 32 synthetic isotopes of yttrium have been observed, with isotopes ranging in atomic mass number from 76 to 108. The least stable isotope is $^{106}Y$ with a half-life of ~ 150 ns to $^{88}Y$, which is the most stable synthetic isotope with a half-life of 106.626 days. Yttrium isotopes with mass numbers below 88 decay to form strontium isotopes, while yttrium isotopes with mass numbers at or above 90 decay to form zirconium isotopes. Yttrium is used: to give a red color in television tubes and light-emitting diodes (LEDs); as microwave filters and magnets in microwave communications equipment (yttrium-iron-garnets); as simulated diamonds (yttrium-aluminum-garnet); in laser systems (neodymium-doped yttrium-aluminum-garnet); as a catalyst for ethane polymerization; in ceramic and glass to increase melting point, shock resistance and low expansion characteristics (yttrium oxide); in the production of electrodes, electrolytes, electronic filters, superconductors, to decrease the grain size in chromium, molybdenum, zirconium, and titanium; as a deoxidizer for vanadium; and to increase the strength of chromium, aluminum, and magnesium metal alloys.

A literature review was conducted to determine an ITSL for yttrium. The following references and databases were searched to derive the above screening level: (EPBCCD), United States Environmental Protection Agency (US EPA) Integrated Risk Information System (IRIS), National Institute for Occupational Safety and Health (NIOSH), American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV) and Biological Exposure Indices (BEI) 2010 guide, National Toxicology Program (NTP) Study Database, International Agency for Research on Cancer (IARC), Acute Database, Chemical Abstract Service (CAS) Online (searched 7/14/11), National Library of Medicine (NLM)-online, EPA Aggregated Computational Toxicology Resource (ACToR) Database, US EPA Toxic Substances Control Act (TSCATS) database, and Hazardous Substances Data Bank (HSDB).

**Derivation of the ITSL**

There is quite a bit of information on the radioactive yttrium-90 isotope used in medicine, but less information is available on elemental yttrium. Reference concentration or reference dose values were unavailable. There is a NIOSH REL of 1 mg/m$^3$ and an ACGIH TLV-Time Weighted Average (TWA) of 1 mg/m$^3$. Based on Rule 232(1)(c) (APCR, 2011), the ITSL can be determined from an occupational exposure level (OEL) by using the following equation:

$$ITSL = OEL \div 100$$

Where the OEL is the REL of 1 mg/m$^3$, converting 1 mg/m$^3$ = 1,000 µg/m$^3$. Entering this value into the above equation,

$$ITSL = 1{,}000\ {}^{\mu g}/_{m^3} \div 100 = 10\ {}^{\mu g}/_{m^3}$$

According to Rule 232(2)(a) (APCR, 2011), the averaging time is 8 hours. The initial threshold screening level (ITSL) for yttrium (CAS # 7440-65-5) is 10 µg/m$^3$ based on an 8-hour averaging time.

**References:**

ACGIH. 2010. TLVs and BEIs Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices. ACGIH Worldwide Signature Publications.

APCR. 2011. Air Pollution Control Rules, Promulgated pursuant to Part 55, Air Pollution Control, of the Natural Resources and Environmental Protection Act, Michigan Department of Environmental Quality. 1994. Act 451, as amended (NREPA).

CDC. 2011. NIOSH Pocket Guide to Chemical Hazards – Yttrium. http://www.cdc.gov/niosh/npg/npgd0673.html

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