3	CAS No.: 7439-92-1 (lead)	Substance: Lead and its compounds

Chemical Substances Control Law Reference No.:

PRTR Law Cabinet Order No.*: 1-304 (lead), 1-305 (lead compounds)

Element symbol: Pb

Atomic Weight: 207.20

*Note: No. in Revised Cabinet Order enacted on October 1, 2009

1. General information

Lead is a metal colored silvery gray or white tinged with blue. Lead is insoluble in water, while lead oxide is slightly soluble or insoluble in water. The water solubility of lead chloride is 1.06×10^4 mg/1000 g (25°C), and the water solubility of lead nitrate is 6.0×10^5 mg/1000 g (25°C).

Lead and its compounds are designated as Class 1 Designated Chemical Substances under the Law Concerning Reporting, etc. of Releases to the Environment of Specific Chemical Substances and Promoting Improvements in Their Management (PRTR Law) (304, lead; 305, lead compounds). The main use of lead is in batteries (storage batteries), and it is also used as a raw material for solder. In addition, it finds use in shotgun pellets and fishing sinkers. The main uses of lead monoxide are as an addition to glass to raise the refractive index, in fluorescent lighting and cathode ray tubes, and as a raw material in stabilizers for polyvinyl chloride resin. The main uses of lead dioxide are in battery electrode components and in curing agents for plastics utilized in putties for window sashes and construction sealants. The main use of lead nitrate is raw materials for matches and explosives. The lead oxide production (shipments) and import quantity in fiscal 2007 was 1,000 to <10,000 t/y. The production and import category under the PRTR Law for both lead and lead compounds was more than 100 t.

---

2. Exposure assessment

Total release to the environment in fiscal 2007 under the PRTR Law was approximately 6,600 t, of which approximately 6,500 t or 98% of overall releases were reported. Among reported release destinations, landfill was the largest. In addition, approximately 7,400 t was transferred to waste materials. Industry types with large reported releases were the non-ferrous metal manufacturing industry for landfill; the non-ferrous metal manufacturing industry and the metal products manufacturing industry for the atmosphere; and the sewage sector, the non-ferrous metal manufacturing industry, and the steelmaking industry for public water bodies. However, releases from the sewage sector are sometimes derived on the basis of lower limit of quantitation values, and therefore, attention must be paid to the fact that there are cases of overestimation. Of unreported releases (for regulated industry types), 1.1 t is estimated to be released accompanying combustion of coal in coal-fired power stations (substances containing low content). Predicting distribution proportions by individual media was not considered appropriate because the chemical forms adopted by lead in the environment vary considerably. Accordingly, a prediction of proportions of distribution of lead into individual media was not carried out.

The predicted environmental concentration (PEC), which indicates exposure to aquatic organisms, was 190 µg/L for public freshwater bodies and 9 µg/L for seawater when set from data representing a high probability of human derivation.

---

3. Initial assessment of ecological risk

With regard to acute toxicity, the following reliable data were obtained: a 72-h median effective concentration (EC_{50}) of 19.5 µg-Pb/L for growth inhibition in the algae (diatom) *Skeletonema costatum*; a 48-h median lethal concentration (LC_{50}) of 26.4 µg-Pb/L for the crustacean *Ceriodaphnia dubia*; and a 96-h LC_{50} of 120 µg-Pb/L for the fish species *Oncorhynchus mykiss* (rainbow trout). A 48-h EC_{50} of 307 µg-Pb/L was also obtained for developmental inhibition in the European purple sea urchin *Paracentrotus lividus*. Accordingly, based on these acute toxicity values and an assessment factor of 100, a

predicted no effect concentration (PNEC) 0.2 µg-Pb/L was obtained.

With regard to chronic toxicity, the following reliable data were obtained: a 14-d no observed effect concentration (NOEC) of 9.1 µg-Pb/L for growth inhibition in the sporophytes of the algae *Champia parvula*; a 44-d NOEC of 17 µg-Pb/L for reproductive inhibition in the Mysidae crustacean *Americamysis bahia*; and a 62-d NOEC of 8 µg-Pb/L for growth inhibition in the fish species *O. mykiss* (rainbow trout). A 133-d NOEC of 12 µg Pb/L was also obtained for mortality in the marsh snail *Lymnaea palustris*. Accordingly, based on these chronic toxicity values and an assessment factor of 10, a predicted no effect concentration (PNEC) of 0.8 µg-Pb/L was obtained. The value of 0.2 µg-Pb/L obtained from the acute toxicity to the algae was used as the PNEC for this substance.

The PEC/PNEC ratio was 950 for freshwater bodies and 45 for seawater. For this reason, the substances are considered as candidates for detailed assessment.

Hazard assessment (basis for PNEC)			Assessment factor	Predicted no effect concentration PNEC (µg-Pb/L)	Exposure assessment		PEC/PNEC ratio	Assessment result
Species	Acute/ chronic	Endpoint			Water body	Predicted environmental concentration PEC (µg/L)		
Algae Diatoms	Acute	EC_{50} Growth Inhibition	100	0.2	Freshwater	190	950	■
					Seawater	9	45	

---

4. Conclusions

	Conclusions	Judgment
Ecological risk	Considered as candidates for detailed assessment.	■

［Risk judgments］○: No need for further work ▲: Requiring information collection

■: Candidates for further work ×: Impossibility of risk characterization