2	CAS No.: －	Substance: Hexavalent chromium compounds

Chemical Substances Control Law Reference No.:

PRTR Law Cabinet Order No.*: 1-88

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

1. General information

The major hexavalent chromium compounds are chromic acid, sodium dichromate, potassium dichromate, lead chromate, zinc chromate, strontium chromate, and calcium chromate. The water solubilities of the major hexavalent chromium compounds range from 0.17 mg/L (25°C) for lead chromate to 1.87×10^6 mg/1,000 g (25℃) for sodium dichromate.

Environmental standards (water, soil, groundwater) have been set for hexavalent chromium. Hexavalent chromium compounds are designated as Class 1 Designated Chemical Substances under effluent standards and the Law Concerning Reporting, etc. of Releases to the Environment of Specific Chemical Substances and Promoting Improvements in Their Management (PRTR Law). The main uses of chromates are as a pigment raw material, as a ceramic raw material, as an abrasive, as an oxidant, and for plating and metal surface treatment. The main uses of sodium dichromate are as a raw material for chromium compounds, as a raw material for pigments and dyestuffs, as oxidants and catalysts, as metal surface treatment, for leather tanning, as corrosion inhibitors, and as analytical reagents. The main uses of calcium dichromate are as a pigment raw material, as a dyestuff material, as an oxidant and catalyst, as a match, firework and pharmaceutical raw material, and as an ignition agent. The main uses of lead chromate, zinc chromate, strontium chromate, and calcium chromate are respectively, yellow pigments, rust prevention paint raw material, raw material for paints and pigments, and colorants.

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2. Exposure assessment

Total release to the environment of hexavalent chromium compounds in FY 2009 under the PRTR Law was 26 t, of which 9 t, or 36% of overall releases, was reported releases. The major destination of reported releases was public freshwater bodies. In addition, approximately 340 t was transferred to waste materials. Industry types that reported large releases to the atmosphere were the chemical industry, the shipbuilding and repair industry, the marine engine manufacturing industry, the metal product manufacturing industry, and the transportation equipment and machinery manufacturing industry. The sewage sector reported large emissions to public water bodies. The largest release among releases to the environment including unreported ones was to water bodies. Predicting proportions of distribution by individual medium was not considered appropriate because the chemical forms of hexavalent chromium compounds in the environment are not clearly understood. Accordingly, a prediction of distribution by medium for hexavalent chromium compounds was not carried out.

The predicted environmental concentration (PEC), which indicates exposure to aquatic organisms, was 20 μg/L for public freshwater bodies and 7 μg/L for seawater when set up from data with a high probability of human activity.

3.Initial assessment of ecological risk

With regard to acute toxicity, the following reliable data were obtained: a 96-h EC_{50} of 84.3 μg Cr/L for growth inhibition in the green algae *Pseudokirchneriella subcapitata*; a 48-h EC_{50} of 15.3 μg Cr/L for immobilization in the crustacean *Daphnia magna*; and a 96-h LC_{50} of 3,400 μg Cr/L for the fish *Oncorhynchus mykiss* (rainbow trout). Also obtained was a 24-h LC_{50} of 45.6 μg Cr/L for the ciliate *Drepanomonas revoluta*. Accordingly, based on these acute toxicity values and an assessment factor of 100, a predicted no effect concentration (PNEC) of 0.15 μg Cr/L was obtained.

With regard to chronic toxicity, the following reliable data were obtained: a 46.5-h NOEC of 36.6 μg Cr/L for growth inhibition in the green algae *Chlorella* sp.; 7-d NOEC of less than 5.66 μg Cr/L for reproductive inhibition in the

crustacean *Ceriodaphnia dubia*; and a 95–97-d NOEC of 51 µg Cr/L for growth inhibition in the fish *Oncorhynchus mykiss* (rainbow trout). Also obtained was a 305-d NOEC of less than 12.5 µg Cr/L for F1-generation reproductive inhibition in polychaete worm *Neanthes arenaceodentata*. Accordingly, based on these chronic toxicity values and an assessment factor of 10, a predicted no effect concentration (PNEC) of less than 0.56 µg Cr/L was obtained.

This 0.15 µg Cr/L obtained from the crustacean acute toxicity was used as the PNEC for this substance.

The PEC/PNEC ratio was 133 for freshwater bodies and 47 for seawater. For this reason, the substances are considered as candidates for detailed assessment. Furthermore, there is thought to be a possibility that the PEC includes not only emissions caused by human, but also natural existence.

Hazard assessment (basis for PNEC)			Assessment factor	Predicted no effect concentration PNEC (µg/L)	Exposure assessment		PEC/ PNEC ratio	Judgment based on PEC/PNEC ratio	Assessment result
Species	Acute/ chronic	End point			Water body	Predicted environmental concentration PEC (µg/L)			
Crustacean *Daphnia magna*	Acute	EC_{50} immobilization	100	0.15	Freshwater	20	133	■	■
					seawater	7	47		

4.Conclusions

	Conclusions	Judgment
Ecological risk	Candidates for further work.	■

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

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

（○）: Though a risk characterization cannot be determined, there would be little necessity of collecting information.

（▲）: Further information collection would be required for risk characterization.