Summary of Initial Risk Assessment Report

Acrylonitrile CAS No : 107-13-1

PRTR No of Japan: 7

This substance is assessed based on Guideline for Initial Risk Assessment Version 1.0

1. General Information

1.1 Physico-chemical properties

Appearance	Colorless liquid
Melting point	-83.55 (degC)
Boiling point	77.3 (degC)
Water solubility	74.5 g/L (at 25degC)
Henry's constant	14.0 Pa*m^3/mol ($1.38*10^{-4}$atm*m^3/mol) (25degC, measured)
Octanol/water partition coefficient (log Kow)	0.25 (measured) , 0.21 (estimated)
Soil adsorption coefficient	Koc = 8 (estimated)

1.2 Environmental fate

Bioaccumulation	Low bioaccumulative Bioconcentration factor (BCF):48(bluegill),measured
Biodegradation	Readily biodegradable
Stability in the environment	(In air) Reaction with OH radicals: Reaction rate constant of 4.1 * $10^{-12}$$cm^3$/molecule-sec. (25degC, measured) The half-life of 2-4 days, given OH radical concentration of $5*10^5$ – $1*10^6$ molecule/cm^3. Reaction with ozone: Reaction rate constant equal to or less than $1.0*10^{-19}$ cm^3/molecule/sec. (25degC, measured) The half - life is four months or more, given ozone concentration of $7*10^{11}$ molecule/cm^3. Reaction with nitrate radical: The data is not available. Acrylonitrile does not absorb light >290 nm and is therefore not susceptible to direct photolysis. (In water) Not expected to hydrolyze in water.
Environmental fate	If released into water, acrylonitrile is expected to be removed mainly by biodegradation and partially by volatilization.

2. Sources of release to the environment

2.1 Annual production, import, export and domestic supply in 2001 (ton/year)

Production	Import	Export	Domestic supply	Remarks
737,813	81,981	139,093	680,701	

2.2 Uses

Resin material for synthetic fibers (53%), acrylonitrile-butadiene-styrene (ABS) resins (21%), AS resins (3%), and NBR (4%). Synthetic raw material for paints and cosmetics (10%) and chemical intermediate for acrylamides (9%)

2.3 Release from the industries within the scope of PRTR system (in 2001)

Release sources		Air (ton)	Waters (ton)	Soil (ton)	Remarks
Listed industries	Reported release	880	72	0	Released into rivers: 120 tons
	Release outside notification	884	72	0	
Release outside notification from non listed industry		--	--	--	
Households		--	--	--	
Mobile sources		--	--	--	
Total		1,764	143	0	

2.4 Releases from other sources

Acrylonitrile is reported to be contained in main-stream and sub-stream cigarette smoke at a rate of 1.14–20.3microg/cigarette and 80.0-104microg/cigarette, respectively. Based on 2002 PRTR "outside notification" release data, the amount of release from cigarettes is estimated to be 30 tons.
It has been also reported that 50-100ppm of acrylonitrile remains in plastics as unreacted monomers.

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2.5 Main release route

Acrylonitrile is expected to be released mainly during use of the substance as a raw material for the production of resins.

3. Exposure Assessment

3.1 Measured environmental concentration

Media	No. of points detected / No. of points measured	No. of samples detected / No. of samples measured	Detection range	95th percentile	Detection limit	Year of investigation, Institution
Air (microg/m^3)	359/359	--/3840	< 0.00015-1.6 (annual average)	--	--	2001 Ministry of the Environment
River water (microg/L)	6/49	--	nd-0.24	0.20	0.05	2000 Ministry of the Environment
Drinking water (microg/L)(as ground water)	1/15	--	nd-0.27	0.10	0.05	2000 Ministry of the Environment
Food (microg/g)	0/9	0/45	--	--	0.0005	1999 Japan Food Research Laboratories

nd: Not detected

For calculation of the 95th percentile, data less than the detection limit are replaced with a value equal to 1/2 of the detection limit.

3.2 Estimated environmental concentration

Media	Estimated concentration	Description
Air (microg/m^3)	1.2	Calculated by mathematical model/ Atmospheric Dispersion Model for Exposure and Risk Assessment (AIST-ADMER) Ver. 1.0
River water (microg/L)	0.88	Calculated by mathematical model/ Integrated River Model to predict the distribution of chemical concentration (IRM1)

3.3 Estimated environmental concentration in water (EEC)

EEC(microg/L)	0.20
	The ninety-fifth percentile of measured concentration in river was used for the risk assessment.

3.4 Estimated human intake

Intake route		Concentration used for estimation of intake	Estimated intake (microg/ person/ day)	Estimated intake (microg/ kg-Bodyweight (BW)/ day)
Inhalation	Air	1.6 (microg/m^3)	32	0.64
		Maximum of annual average of measured concentrations surveyed by Ministry of the Environment was used for the risk assessment.		
Oral	Drinking water	0.10 (microg/L)	0.20	0.004
		As data of drinking water were not available, measured concentrations in ground water were used. The ninety-fifth percentile of measured concentrations in ground water was used for the risk assessment.		
	Food	0.00025 (microg/g)	0.5	0.01
		Acrylonitrile was not detected in any samples during a 3-day duplicate diet study of generic Japanese households. As a result, the value (0.00025 microg/g) equal to 1/2 of the detection limit is used for the risk assessment.		
	Sub total	--	0.7	0.014
Total route		--	33	0.65

1) This substance is assessed based on Guideline for Initial Risk Assessment Version 1.0. So when adequate measured concentrations are available, they are given priority and used as values for risk assessment. If not available, an estimated value with model is used.

4. Hazard assessment

4.1 Effects on organisms in the environment

	Acute or Chronic	Species	Endpoint	Concentration
Algae	Chronic	*Skeletonema costatum*	72 hours NOEC Growth inhibition (biomass)	0.41 (mg/L)
Crustacea	Chronic	*Daphnia magna*	21days NOEC Reproduction	0.5 (mg/L)
Fish	Chronic	*Pimephamelas promelas*	30 days NOEC Growth	0.34 (mg/L)
Key study		Data of fish (*Pimephamelas promelas*) was chosen for the key study because effects were observed at the lowest concentration in the hazard assessment.		

4.2 Human health toxicity

Toxicity	Exposure route	Species	Duration / Dose method	Toxic effects (Key study is underlined)	NOAEL or LOAEL (converted)
Repeated dose toxicity	Inhalation	Rat	2 years	Decreased body weight, suppurative rhinitis, hyperplasia of respiratory epithelium in nasal turbinate mucosa, focal erosion of mucosal lining and squamous metaplasia of respiratory epithelium, extramedullary haemopoiesis in liver and spleen, focal liver cell necrosis, increased mortality rate	LOAEL 20 ppm (45 mg/m^3), (converted 6.0 mg/kg/day)
	Oral	Rat	2 years Drinking water	Increased mortality in males, elevated ALP levels in females, reduced body weight, increased relative liver and kidney weight, decreased RBC, Hct and Hgb values in females	NOAEL 3ppm, (Male: 0.25mg/kg/day)
	Dermal	-	-	-	-
Reproductive and developmental toxicity	Oral	The substance may be developmental toxic, since anomaly of fetus in bone and internal organs. Though they are observed at dose in which toxicity is shown in dam.			
Carcinogenicity	Evaluation by IARC: Group 2B (possibly carcinogenic to humans)				
Genotoxicity	Considered to be genotoxic.				

5. Risk Assessment

5.1 Environmental organisms

	EEC (microg/L)	NOEC * (mg/L)	MOE (NOEC * /EEC)	Product of uncertainty factors	Conclusion
Risk characterization	0.20	LOEC: 0.34	1,700	20	No immediate concern
	Product of uncertainty factors (UF): Extrapolation from laboratory test (10) * Additional factor by assessor's judgment due to quality of test (2) = 20				
Recommendation : The substance is considered to be of no immediate concern for the moment, and low priority of further work.					

NOEC* means NOEC, LOEC, EC_{50}, etc.

5.2 Human health

5.2.1 Repeated dose toxicity

Routs of exposure	Intake (microg/kgBW/day)	NOAEL (mg/kgBW/day)	Risk characterization		
			MOE	Product of uncertainty factors	Conclusion
Inhalation	0.64	LOAEL: 6.0	9,400	1,000	No immediate concern.
Oral	0.014	0.25	18,000	100	No immediate concern
Total	0.65	0.25 (Oral)	380	100	No immediate concern
Product of uncertainty factors (UF): (Inhalation) Interspecies (10) * Intraspecies (10) * Using LOAEL (10) = 1000 (Oral and total) Interspecies (10) * Iintraspecies (10) = 100					

5.2.2 Reproductive and developmental toxicity

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5.2.3 Carcinogenicity

Risk characterization of carcinogenicity of the substance was not carried out in this assessment.

5.2.4. Recommendation

The substance is considered to be of no immediate concern for the moment, and low priority of further work except for carcinogenicity.

6. Supplement

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