Addendum to SIDS Initial Assessment Report

For

15th SIAM

Boston, Massachusetts, 22-25 October 2002

1. Chemical Name:	n-Butyl Acrylate
2. CAS Number:	141-32-2
3. Sponsor Country:	United States
	National SIDS Contact Point in Sponsor Country Oscar Hernandez Division Director RAD 7403 M 1200 Pennsylvania Avenue, NW Washington DC, 20460 (202) 564-7461
4. Shared Partnership with:	ICCA
5. Roles/Responsibilities of the Partners:	
• Name of industry sponsor /consortium	Industry Contact: Elizabeth Hunt Basic Acrylic Monomer Manufacturers, Inc. 17260 Vannes Court Hamilton, VA 20158 phone: 540-751-2093
• Process used	
6. Sponsorship History	
• How was the chemical or category brought into the OECD HPV Chemicals Programme?	The SIDS Initial Assessment Report of this chemical had been discussed and the conclusion and recommendation were agreed at SIAM 15. The recommendation was that the chemical is currently of low priority of further work. The chemical possesses properties indicating a hazard for human health and the environment. Based on data presented by the Sponsor country, exposure to humans and the environment is anticipated to be low, and therefore this chemical is currently a low priority for further work. Countries may desire to investigate any exposure scenarios that were not presented by the Sponsor country. The original assessment documents are published by UNEP Chemicals as a SIDS Publication in March 2005. Additional

information on biodegradation was reviewed by member countries in 2006 and agreed in 2007. The current documents include an update of the SIDS Profile as well as addenda to the SIDS Initial Assessment Report and the SIDS Dossier, based on the results of post-SIDS testing. The recommendation has not changed.

7. Review Process Prior to the SIAM:

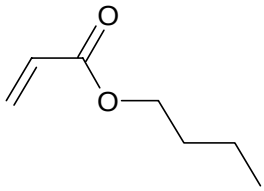
8. Quality check process:

9. Date of Submission:

10. Date of last Update: 20 August 2007

11. Comments:

SIDS INITIAL ASSESSMENT PROFILE

CAS No.	141-32-2
Chemical Name	n-Butyl Acrylate
Structural Formula	

SUMMARY CONCLUSIONS OF THE SIAR

Category/Analogue Rationale

In some circumstances, available data on iso-butyl acrylate (CAS No. 106-63-8) may be presented to assist in the weight of evidence approach for n-butyl acrylate, based on structural similarities. Since sufficient data exists for n-butyl acrylate for the majority of SIDS endpoints, data on iso-butyl acrylate is only presented for those endpoints in which further supporting data may assist in adding to the characterization of a particular endpoint. This is done primarily for the aquatic toxicity endpoints.

Human Health

After oral administration, n-butyl acrylate is rapidly absorbed and metabolized in male rats (75% was eliminated as CO_2, approximately 10% via urine and 2% via feces). The major portion of n-butyl acrylate was hydrolyzed by carboxyesterase to acrylic acid and butanol.

Following acute exposure, n-butyl acrylate exhibits low toxicity. n-Butyl acrylate has oral LD50s of 3143 mg/kg bw (rats) and 9050 mg/kg bw (male rats), an inhalation LC50 (4-hour, rat) of 10.3 mg/L and a dermal LD50 (rabbit) of 2000 to 3024 mg/kg. n-Butyl acrylate is irritating to skin and eyes and showed a skin sensitizing potential in animals. In humans, skin sensitization to butyl acrylate was reported.

In an oral (drinking water) 90-day study in rats, using a satellite group (gavage) at 150 mg/kg bw/day, the only effects reported were a slight reduction in water consumption in all dose groups and a decrease in weight gain in the highest dose group. The NOAEL (males) = 84 mg/kg/bw/day and NOAEL (females) = 111 mg/kg/bw/day. The NOAEL (gavage) (males and females) = 150 mg/kg/bw/day. In a 90-day inhalation study, rats were exposed to 0, 21, 108, 211, and 546 ppm (0, 0.11, 0.57, 1.12, 2.90 mg/L) n-butyl acrylate. The primary effects at 211 ppm (1.12 mg/L) were irritation of eyes and nasal mucosa, reduced body weights (13.3 percent in males and 3.76 percent in females compared with controls), decreased potassium values (females) and an increase in alkaline phosphatase activity (females.) At the highest dose of 546 ppm (2.90 mg/L) 31 of 40 animals died. The primary cause of death was due to the strong irritation of the substance on the respiratory tract. The NOAEL = 108 ppm (0.57 mg/L/day) and the LOAEL = 211 ppm (1.12 mg/L/day). In a two-year inhalation study, rats (male/female) received whole body exposures of 0, 15, 45, or 135 ppm (0, 0.086, 0.258, 0.773 mg/L). There was a slight decrease in food consumption and slightly lower relative heart, kidney, liver and thyroid weights at the highest dose. A NOAEL was determined to be 45 ppm (0.258 mg/L/day) based upon localized and diffuse stippling of the corneal epithelium, cloudiness of the cornea, and various degrees of vascularization. The severity of nasal mucosa effects increased with dose and occurred at all doses in males and females. Effects ranged from slight atrophy of the neurogenic part of the olfactory epithelium at 15 ppm (0.086 mg/L) to partial loss of the columnar cell layer and stratified reserve-cell hyperplasia at 45 (0.258 mg/L) and 135 ppm (0.773 mg/L).

n-Butyl acrylate was negative in the Ames test with *Salmonella typhimurium* TA98, TA100, TA1535 and TA1537 with and without metabolic activation tested up to 10,000 µg/plate. In a cytogenetic assay with Chinese Hamster Ovary Cells, n-butyl acrylate showed no clastogenic potential in concentrations where no cytotoxicity occurred. Without metabolic activation an increase of aberrant cells was observed at cytotoxic concentrations. No genotoxic effects were found in an *in vitro* micronucleus test and an UDS-test with Syrian hamster fibroblasts. In an *in vivo* cytogenetic assay, n-butyl acrylate showed no clastogenic effect in rats and hamsters after inhalation exposure.

n-Butyl acrylate was not carcinogenic to rats via inhalation up to 135 ppm (0.773 mg/L/day), the highest dose tested.

No reproductive toxicity studies are available. However, in repeated-dose studies (noted above), no effects were seen in the reproductive organs. In developmental toxicity studies with rats via inhalation, n-butyl acrylate caused fetotoxic effects (resorptions and reduced number of live fetuses at $\geq$135 ppm) at maternally toxic concentrations. At exposures of 25, 135 and 250 ppm (0.13, 0.72 and 1.33 mg/L/day), the NOAEL (maternal) = 25 ppm (0.13 mg/L/day) based on reduced body weights and irritation to the eyes and nose. The NOAEL (developmental) = 25 ppm (0.13 mg/L/day), based on post-implantation loss and the NOAEL (teratogenicity) = 250 ppm. In a separate study, female rats were given 100, 200 and 300 ppm. A maternal NOAEL could not be determined based on a reduction of absolute body weight gain at all doses; the maternal LOAEL was set at 100 ppm. At 200 and 300 ppm there was a reduction in fetal body weights. Sporadic malformations occurred at 300 ppm and in the control group. The NOAEL (developmental) was 100 ppm and the NOAEL (teratogenicity) was 300 ppm (highest dose tested).

Environment

The water solubility of n-butyl acrylate is 2 g/L (25 °C) and specific gravity is 0.898 g/cm^3 at 20 °C. The measured log Kow is 2.38 (25 °C). The vapor pressure (based on a regression analysis of measured values from several data sources) is 7.27 hPa at 25 °C. The melting point is - 64°C and the boiling point is 148 °C. The chemical is highly flammable and its flashpoint is approximately 36 ^{0}C. n-Butyl acrylate is photodegraded by reaction with hydroxyl radicals in the atmosphere with a half-life of 1.2 days (calculated). The hydrolysis rate of n-butyl acrylate is extremely low. At pH 7, the approximate half-life is calculated to be 1100 days. The Henry's law constant is 4.7 x 10^{-4} atm/m^3/mol, indicating the potential for moderate volatilization from water. Distribution modeling using Mackay Level I indicates that the main target compartment will be air (94%) with smaller amounts partitioning into water (5.73%) soil (0.11%), and sediment (0.11%). Fugacity model Level III gives comparable results; the levels are: 89.4% (air), 8.24% (water), 2.39% (soil) and 0.0963% (sediment). A BCF of 13 was determined, based on a log K_{ow} of 2.38, indicating a low bioaccumulation potential. In a biodegradation assay according to OECD Guideline 301C (modified MITI-Test (I)) n-butyl acrylate was readily biodegradable (61% after 14 days). In another ready biodegradation test conducted according to ISO 14593 (identical to OECD Guideline 310), n-butyl acrylate was readily biodegradable (91 % degradation after 28 days). In acute aquatic toxicity studies, n-butyl acrylate was determined to have toxic effects in the concentration range of 2.1 to 8.2 mg/L. A measured fish 96-hr LC50 of 2.1 mg/L was determined in a flow-through test in *Cyprinodon variegates.* A measured aquatic invertebrate 48-hr EC50 of 8.2 mg/L was determined in a flow-through test in *Daphnia magna.* Finally, in algae (*Selenastrum capricornutum*) a growth-rate study using measured concentrations resulted in a 96-hr EC50 of 2.6 mg/L (arithmetic mean). In addition, supporting data from iso-butyl acrylate indicate toxicity values with in the same ranges. For iso-butyl acrylate, the most sensitive species was the freshwater fish *Pimephales promelas* (fathead minnow) with a 96-hour LC50 of 2.09 mg/L (measured). The 48-hour EC50 for *Daphnia magna* is 9.7 mg/L (nominal), and for algae (*Desmodesmus subspicatus)* the 72-hour EC50s were 3.18 mg/L (measured) for biomass and 5.28 mg/L (measured) for growth rate.

Exposure

n-Butyl acrylate is manufactured as a chemical intermediate in a closed system. Its major use is in the production of homo- and co-polymers with other monomers (i.e. acrylic acid and its salts, esters, amides, etc.) to produce emulsion polymers. The three major uses of acrylate esters are: surface coatings, adhesives/sealants and textiles. In 2000, production volumes were 250,000 – 400,000 tonnes for Europe, 581,000 tonnes for the US and 130,000 tonnes for Japan. In 2000, US TRI reporting indicates that the majority of n-butyl acrylate is released to the air compartment (94%, 233,013 pounds) where it is subject to photolysis. However, a small percentage is released to the water compartment (6%, 14,566 pounds). Impact on the environment is expected to be low due to photolysis and biodegraditive properties. Extensive occupational exposure monitoring records are available which indicate that 8 hr TWAs for a variety of operations are below the regulatory/guideline values of 2 ppm (8hr TWA). However, peak exposures were reported above the 2 ppm value and in some circumstances exceeded the NIOSH REL of 10 ppm (TWA) during sampling, cleaning, change of pump filter, check of detonation arrestors, inhibitor preparation, drumming and waste disposal. Records indicate that personnel performing these tasks wear the appropriate personal protective equipment and therefore, exposures to pesonnel are estimated to be lower depending upon protection factors of the personal protective equipment. End-use consumer products contain only trace levels of acrylic acid and esters (as a result of polymerization). Therefore, consumer exposure to acrylate monomers is likely to be low.

RECOMMENDATION AND RATIONALE FOR THE RECOMMENDATION AND NATURE OF FURTHER WORK RECOMMENDED

The chemical is currently of low priority for further work. The chemical possesses properties indicating a hazard for human health and the environment. Based on data presented by the Sponsor country, exposure to humans and the environment is anticipated to be low, and therefore this chemical is currently a low priority for further work. Countries may desire to investigate any exposure scenarios that were not presented by the Sponsor country.

Addendum

to

SIDS Initial Assessment Report

Note: Only the sections of the SIDS Initial Assessment Report which are affected by the results of the post-SIDS testing are presented below. For the original SIDS initial assessment documents, see the SIDS Publication published by UNEP Chemicals in March 2005.

2.2 Environmental Exposure and Fate

2.2.5. Biodegradation

In a biodegradation assay, (OECD Guideline 301 C, modified MITI Test (I)), n-butyl acrylate was readily biodegradable: 100 mg test substance/l; sludge concentration: 30 mg/l; 61 % biodegradation after 14 days expressed as BOD (Chemicals Inspection & Testing Institute Japan, 1992). In a Closed Bottle Test (OECD-Guideline 301D) with secondary effluent of a domestic waste water treatment plant a biodegradation of 57.8 % within 28 days was achieved (Wu, 1996) A CO2-Headspace Test according to ISO 14593 (identical to OECD 310) was conducted at a n-butyl acrylate concentration of about 31 mg/l at 22 °C in the dark. The inoculum was activated sludge from a laboratory wastewater treatment plant fed with municipal sewage. n-butyl-acrylate attained 91% biodegradation within 28 days expressed as TIC/ThIC. Thus, n-butyl acrylate was readily biodegradable according to OECD criteria under the conditions of the test.

Addendum to SIDS Dossier

ROBUST STUDY SUMMARY
for
Post SIDS Testing of n-Butyl Acrylate
CAS No. 141-32-2

Sponsor country: United States

DATE: 2 September 2005

Type: aerobic
Inoculum: activated sludge, domestic
Concentration: 31 mg/l related to Test substance
20 mg/l related to DOC (Dissolved Organic Carbon)
Contact time: 28 day(s)
Degradation: = 80 - 90 % after 28 day(s)
Result: readily biodegradable
Kinetic: 3 day(s) = 15 %
7 day(s) = 50 %
10 day(s) = 80 %
14 day(s) = 90 %
21 day(s) = 91 %
Control Subst.: Aniline
Kinetic: 3 day(s) = 35 %
14 day(s) = 94 %

Method: other: ISO 14593 (identical to OECD 310)
Year: 1999
GLP: yes

Result: Duration of adaptation phase (days): 2
Duration of degradation phase (days): 12
Degradation degree of the test substance at the end of the test (% TIC/ThIC): 80-90
Degradation of the test substance at the end of the 10-day window (% TIC/ThIC): 80-90

Degradation degree of the reference substance after 14 days (% TIC/ThIC): 90-100
Degradation degree in the inhibition control 14 days (% TIC/ThIC) 80-90
Physical-chemical (abiotic) elimination of the test substance at the end of test (% TIC/ThIC): <10

The test substance is readily biodegradable (according to OECD criteria).
Test condition: Inoculum:
Activated sludge from a laboratory wastewater plant treating municipal sewage.
Concentration of dry substance 4 mg/l.
Test substance: Name of test substance: n-Butyl Acrylate (n-BA)
Batch number: 30010013680
Substance number: 03/0348-2
Date of filling: 10 Nov 2004
CAS number: 141-32-2
Purity of the test substance [%]: 99.7
Impurities: no details

Analytical Report Project No.: 0001808016-101104-08_1 of BASF Antwerpen
Reliability: (1) valid without restriction
guideline study conducted in compliance with GLP regulations

Flag: Critical study for SIDS endpoint
02-SEP-2005 (42)

Reference: BASF AG, Department of Product Safety, unpublished data, Project No.: 27G0348/033056, 24 Mar 2005.