

**GreenScreen® Assessment for [Melamine Cyanurate (CAS# 37640-57-6)]**

**Method Version: GreenScreen® Version 1.2<sup>1</sup>**

**Verified or Non-Verified<sup>2</sup>: NON-VERIFIED**

**Introduction<sup>3,4,5</sup>**

This GreenScreen assessment is based on the information reported in the corresponding chemical hazard profile in “An Alternatives Assessment for the Flame Retardant Decabromodiphenylether (DecaBDE) Final Report”<sup>3</sup>. Additional information on hazard endpoints beyond what was included in the final report was not sought with the exception of reactivity. Hazard classification information for reactivity was supplemented because it is not included in the DfE report but is needed to apply the GreenScreen Benchmark system.

Hazard classification levels reported in the DfE profiles and in this GreenScreen report may differ due to differences between criteria as defined in the DfE “Alternatives Assessment Criteria for Hazard Evaluation”<sup>4</sup> and the GreenScreen for Safer Chemicals v1.2 methods<sup>5</sup>. Any differences in interpretation are explained and justified in this GreenScreen report.

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Licensed Profiler or Certified Practitioner (specify): N/A	

**Confirm application of the *Disclosure and Assessment Rules and Best Practice*<sup>6</sup>:** (List any deviations)

Disclosure thresholds applied by DfE are unclear in the DfE report.

<sup>1</sup> Use GreenScreen® Assessment Procedure (Guidance) V1.2

<sup>2</sup> “NON-VERIFIED” means that Verification Has Not Been Performed on this GreenScreen Assessment

<sup>3</sup> An Alternatives Assessment for the Flame Retardant Decabromodiphenylether (DecaBDE) Final Report Available at: <http://www.epa.gov/dfe/pubs/projects/decaBDE/deca-report-complete.pdf>, p 4-383, accessed 2/9/2014.

<sup>4</sup> Available at: [http://www.epa.gov/dfe/alternatives\\_assessment\\_criteria\\_for\\_hazard\\_eval.pdf](http://www.epa.gov/dfe/alternatives_assessment_criteria_for_hazard_eval.pdf), accessed 10/2013.

<sup>5</sup> Details available at: <http://www.cleanproduction.org/Greenscreen.v1-2.php>, accessed 10/2013.

<sup>6</sup> See GreenScreen Guidance V1.2 Section 8

**Chemical Name (CAS #):**

Melamine Cyanurate (CAS# 37640-57-6)

**Also Called:**

1,3,5-Triazine-2,4,6(1H,3H,5H)-trione, compd. with 1,3,5-triazine-2,4,6-triamine (1:1) (TSCA Inventory); 1,3,5-triazinane-2,4,6-trione - 1,3,5-triazine-2,4,6-triamine (1:1); Melamine isocyanurate

**Tradenames:**

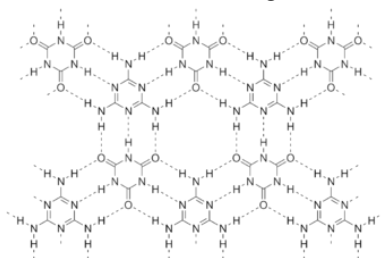
Melapur MC XL

**Suitable analogs or moieties of chemicals used in this assessment (CAS #'s):**

Confidential analog, nitrogen heterocycles

**Chemical Structure(s):**

\*Note: Include chemical structure(s) of all suitable analogs (and /or moieties) used in the assessment.



**Notes related to production specific attributes<sup>7</sup>:**

**For Inorganic Chemicals and relevant particulate organics (if not relevant, list NA)**

**Define Properties:**

While melamine cyanurate is an inorganic chemical, information to address this section is not available in the DfE report.

1. Particle size (e.g. silica of respirable size): N/A<sup>8</sup>
2. Structure (e.g. amorphous vs. crystalline): N/A
3. Mobility (e.g. Water solubility, volatility): N/A
4. Bioavailability: The melamine cyanurate complex is expected to have limited bioavailability for dermal and inhalation routes of exposure due to its low water solubility under neutral conditions. It is expected to not be absorbed through skin and have poor absorption through the lung and gastrointestinal tract. The dissolution of melamine cyanurate and the solubility and precipitation of melamine and cyanuric acid appear to be pH dependent indicating that ingestion of this compound may enhance bioavailability.

**Identify Applications/Functional Uses:  
(e.g., Cleaning product, TV casing)**

<sup>7</sup> Note any composition or hazard attributes of the chemical product relevant to how it is manufactured. For example, certain synthetic pathways or processes result in typical contaminants, by-products or transformation products. Explain any differences between the manufactured chemical product and the GreenScreen assessment of the generic chemical by CAS #.

<sup>8</sup> While melamine cyanurate is an inorganic chemical, information to address items 1-3 is not available in the DfE report.

## 1. Flame Retardant

### GreenScreen Benchmark Score and Hazard Summary Table:<sup>9,10,11,12</sup>

Melamine cyanurate was assigned a **Benchmark Score of 1** based on very high persistence in addition to high group II\* human toxicity endpoints (repeat dose systemic toxicity).

Green Screen Hazard Ratings: [ <i>Melamine cyanurate</i> ]																			
Group I Human					Group II and II* Human								Ecotox		Fate		Physical		
C	M	R	D	E	AT	ST		N		SnS*	SnR*	IrS	IrE	AA	CA	P	B	Rx	F
						single	repeated*	single	repeated*										
<i>M</i>	<i>M</i>	<i>M</i>	<i>M</i>	DG	<i>L</i>		<b>H</b>		<i>L</i>	<i>M</i>	DG	<i>L</i>	<i>M</i>	<i>L</i>	<i>L</i>	<b>vH</b>	<b>vL</b>	<i>L</i>	<b>L</b>

Note: Hazard levels (Very High (vH), High (H), Moderate (M), Low (L), Very Low (vL)) in *italics* reflect estimated values, authoritative B lists, screening lists, weak analogues, and lower confidence. Hazard levels in **BOLD** font are used with good quality data, authoritative A lists, or strong analogues. Group II Human Health endpoints differ from Group II\* Human Health endpoints in that they have four hazard scores (i.e., vH, H, M and L) instead of three (i.e., H, M and L), and are based on single exposures instead of repeated exposures.

### Environmental Transformation Products and Ratings<sup>13</sup>:

Identify feasible and relevant environmental transformation products (i.e., dissociation products, transformation products, valence states) and/or moieties of concern<sup>14</sup>

Functional Use	Life Cycle Stage	Transformation Pathway	Environmental Transformation Products	CAS #	Feasible and Relevant?	GreenScreen List Translator Score or GreenScreen Benchmark Score
			Melamine	108-78-1		LT-P1 (Pharos)
			Cyanuric acid	108-80-5		LT-U (Pharos)

### Introduction

From the DfE report, “This alternative is an organic salt of melamine (CASRN 108-78-1) and cyanuric acid (CASRN 108-80-5) organized in a well ordered crystalline complex, with extensive intramolecular hydrogen bonding. The abundance of complimentary hydrogen bonds effectively link

<sup>9</sup> See Appendix A for a glossary of hazard endpoint acronyms

<sup>10</sup> See Appendix B for alternative GreenScreen Hazard Summary Table (Classification presented by exposure route)

<sup>11</sup> For inorganic chemicals only, see GreenScreen Guidance V1.2 Section 14.4. (Exceptions for Persistence)

<sup>12</sup> For Systemic Toxicity and Neurotoxicity, repeated exposure data are preferred. Lack of single exposure data is not a Data Gap when repeated exposure data are available. In that case, lack of single exposure data may be represented as NA instead of DG. See GreenScreen Guidance V1.2 Section 9.3.

<sup>13</sup> See GreenScreen Guidance V1.2 Section 13

<sup>14</sup> A moiety is a discrete chemical entity that is a constituent part or component of a substance. A moiety of concern is often the parent substance itself for organic compounds. For inorganic compounds, the moiety of concern is typically a dissociated component of the substance or a transformation product.

melamine and cyanuric acid into stable lattice chains. The potential for dissolution of these chains are dependent on pH. The simplest 1:1 melamine cyanurate complex has an empirical molecular weight of 255; although higher molecular weight networks are expected because the integrated melamine cyanurate complex has a higher degree of stabilization than isolated components (Perdigão, 2006). This assessment will consider the worst case hazard concerns which may include those from the dissolution of melamine and cyanuric acid from the complex.”<sup>15</sup>

## **Hazard Classification Summary Section:**

### **For all hazard endpoints:**

- **Search all GreenScreen specified lists. Report relevant results either in each hazard endpoint section or attach to the end of the report.**
- **Always indicate if suitable analogs or models were used.**
- **Attach modeling results (See Appendix C).**
- **Include all references either in each hazard endpoint section or at the end of the report.**

### **Group I Human Health Effects (Group I Human)**

#### **Carcinogenicity (C) Score (H, M or L): *M***

Melamine cyanurate was assigned a score of MODERATE for Carcinogenicity based on a moderate score and data provided within the EPA’s DfE alternatives assessment. The moderate designation in both GreenScreen and EPA’s alternatives assessment is based on the same measured endpoints. The score was based on melamine and is therefore reported in italics within the GreenScreen assessment.

The summary provided within the EPA’s alternatives assessment was as follows:

MODERATE: Estimated based on the dissolution product melamine. There is evidence that oral melamine exposure causes carcinogenicity in experimental animals; however, there was no evidence located as to its carcinogenicity to humans. Tumor formation in animals appears to happen in a mechanical nature under conditions in which it produces bladder calculi. Cyanuric acid is not carcinogenic. There were no data located as to the carcinogenic potential of the melamine cyanurate complex. IARC classifies melamine as Group 3: not classifiable as to its carcinogenicity to humans.

#### **Mutagenicity/Genotoxicity (M) Score (H, M or L): *M***

Melamine cyanurate was assigned a score of MODERATE for Mutagenicity based on a moderate score within the EPA’s DfE alternatives assessment. The moderate designation in both GreenScreen and EPA’s Alternatives assessment is based on the same measured endpoints. The score was based on empirical data for melamine within EPA’s alternatives assessment as no data was located specific to melamine cyanurate. Therefore the score is reported in italics within the GreenScreen assessment.

The summary provided within the EPA’s alternatives assessment was as follows:

MODERATE: Estimated based on positive results for chromosomal aberrations in vivo in mice exposed to the dissolution product melamine. There were also positive results in vitro for DNA synthesis-inhibition in Hela S3 cell and genetic toxicity in Escherichia coli WP2s in a microscreen assay following melamine exposure. Cyanuric acid does not cause gene mutations or chromosomal aberrations in vitro. There were no genotoxicity data located for melamine cyanurate.

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<sup>15</sup> An Alternatives Assessment for the Flame Retardant Decabromodiphenylether (DecaBDE) Final Report  
Available at: <http://www.epa.gov/dfepubs/projects/decaBDE/deca-report-complete.pdf>, p 4-383, accessed 2/9/2014.

**Reproductive Toxicity (R) Score (H, M, or L): *M***

Melamine cyanurate was assigned a score of MODERATE for Reproductive Toxicity based on a moderate score within the EPA's DfE alternatives assessment. For reproductive toxicity, EPA's DfE uses numerical data quantifying the hazard associated with the 3 different hazard levels, whereas GreenScreen does not base the hazard score on a numerical rating system but bases classifications on listing under GHS, the EU, and NTP. Therefore the conversion of DfE's developmental and reproductive toxicity conclusions to comparable GreenScreen hazard scores is done on a case by case basis. In this case DfE's moderate score was estimated made based on analogy to a confidential analog. It is reported as a NOAEL with no LOAEL identified and no study details provided. The score was based on expert judgment within EPA's alternatives assessment and therefore is reported in italics within the GreenScreen assessment.

The summary provided within the EPA's alternatives assessment was as follows:

MODERATE: Potential for reproductive toxicity estimated based on data for a confidential analog that reports a NOAEL of 1,600 ppm (191-341 mg/kg/day) in rats orally exposed. Data based on the dissolution products indicate no effects on reproductive parameters in rats orally exposed to cyanuric acid for up to 3 generations or when exposed to melamine in a 13-week toxicity study. There were no data located regarding reproductive toxicity following exposure to melamine cyanurate.

**Developmental Toxicity incl. Developmental Neurotoxicity (D) Score (H, M or L): *M***

Melamine cyanurate was assigned a score of MODERATE for Developmental Toxicity based on a moderate score within the EPA's DfE alternatives assessment. For developmental toxicity, EPA's DfE uses numerical data quantifying the hazard associated with the 3 different hazard levels, whereas GreenScreen does not base the hazard score on a numerical rating system but bases classifications on listing under GHS, the EU, and NTP. Therefore the conversion of DfE's developmental and reproductive toxicity conclusions to comparable GreenScreen hazard scores is done on a case by case basis. DfE's low score was estimated based on analogy to nitrogen heterocycles and therefore is reported in italics within the GreenScreen assessment.

The summary provided within the EPA's alternatives assessment was as follows:

MODERATE: Estimated based on analogy to nitrogen heterocycles. Data for dissolution products melamine and cyanuric acid indicate no developmental effects in rats orally exposed to cyanuric acid or melamine during gestation. There were no data located regarding developmental toxicity following exposure to melamine cyanurate.

**Endocrine Activity (E) Score (H, M or L): DG**

Melamine cyanurate was assigned a score of DATA GAP for Endocrine Activity based on the final conclusion presented within the EPA's DfE alternatives assessment. While information was provided that reported melamine showed no estrogenic activity (no change in B-galactosidase activity) in an *in vitro* yeast two-hybrid assay in *Saccharomyces cerevisia* Y 190, a data gap score was assigned based on insufficient data located to describe the effect of Melamine cyanurate on the endocrine system.

The summary provided within the EPA's alternatives assessment was as follow:

There were insufficient data located to describe the effect of melamine cyanurate on the endocrine system. In one study, melamine did not exhibit estrogenic activity in vitro in a yeast two-hybrid assay.

**Group II and II\* Human Health Effects (Group II and II\* Human)**

*Note: Group II and Group II\* endpoints are distinguished in the v 1.2 Benchmark system (the asterisk indicates repeated exposure). For Systemic Toxicity and Neurotoxicity, Group II and II\* are considered sub-endpoints. When classifying hazard for Systemic Toxicity/Organ Effects and Neurotoxicity endpoints, repeated exposure results are required and preferred. Lacking repeated exposure results in a data gap. Lacking single exposure data does not result in a data gap when repeated exposure data are present (shade out the cell in the hazard table and make a note). If data are available for both single and repeated exposures, then the more conservative value is used.*

**Acute Mammalian Toxicity (AT) Group II Score (vH, H, M or L): L**

Melamine cyanurate was assigned a score of LOW for Acute Mammalian Toxicity. The acute mammalian toxicity classification in both the EPA's DfE alternatives assessment and GreenScreen is based on the same measured endpoints. While the EPA's alternatives assessment gives melamine cyanurate a low rating, the information provided within the DfE report indicates the chemical could fulfill the moderate hazard score under the GreenScreen methodology. Specifically melamine is reported to have an inhalation LC<sub>50</sub> of 3.2 mg/L. This value however has not been included. Melamine cyanurate is estimated to have limited bioavailability and therefore is of low potential for the inhalation route of exposure. The exclusion of this inhalation concentration is based on professional judgment and therefore is reported in italics within the GreenScreen assessment.

The summary provided within the EPA's alternatives assessment was as follows:

LOW: Estimated based on measured acute oral, dermal, and inhalation toxicity values for the dissolution products melamine and cyanuric acid. The melamine cyanurate complex is also estimated to have limited bioavailability and water solubility that is consistent with a low concern for dermal and inhalation routes of exposure.

**Systemic Toxicity/Organ Effects incl. Immunotoxicity (ST)**

**(ST-single) Group II Score (single dose: vH, H, M or L): N/A**

Melamine cyanurate was assigned a score of NOT APPLICABLE (N/A) for Systemic toxicity/Organ Effects based on single exposure. Data were not provided by EPA on single dose toxicity for systemic toxicity/organ effects. Using GreenScreen criteria, absence of single dose data is not considered a data gap as long as data are available for repeated dose.

DfE evaluates Systemic Toxicity based on repeated exposures. Lack of data for Systemic Toxicity based on a single exposure does not constitute a data gap when data for repeated exposures are available.

**(ST-repeat) Group II\* Score (repeated dose: H, M, L): H**

Melamine cyanurate was assigned a score of HIGH for Systemic Toxicity/Organ Effects based on repeated exposure. The high designation for systemic toxicity/organ effects based on repeated exposure in both GreenScreen and EPA's alternatives assessment is based on the same measured endpoints. The high score was based on 7-day exposures which observed effects at 66 mg/kg-day and a 14-day simultaneous exposure to both melamine and cyanuric acid which observed effects at 12 mg/kg-day. Both results correspond to a high hazard concentration ( $\leq 10$  mg/kg) when adjusted to a 90-day chronic exposure period. The score was based upon empirical data within EPA's alternatives assessment and therefore is not reported in italics within the GreenScreen assessment.

The summary provided within the EPA's alternatives assessment was as follows:

HIGH: Based on kidney toxicity following repeated oral exposure to melamine cyanurate and simultaneous co-exposure to melamine and cyanuric acid in rats. Kidney effects included increased

plasma BUN and creatinine levels, the formation of precipitates in the kidney and acute renal failure. Repeated oral exposure to the dissolution product melamine also results in urinary bladder stones at doses in the moderate hazard range. The hazard designation for cyanuric acid is considered to be low.

In addition:

Located data were not sufficient to determine the hazard potential for the immunotoxicity endpoint.

#### **Neurotoxicity (N)**

**(N-single) Group II Score (single dose: vH, H, M or L): N/A**

Melamine cyanurate was assigned a score of NOT APPLICABLE (N/A) for Neurotoxicity based on single exposure. Data were not provided by EPA on single dose toxicity for neurotoxicity. Using GreenScreen criteria, absence of single dose data is not considered a data gap as long as data are available for repeated dose.

DfE evaluates Neurotoxicity based on repeated exposures. Lack of data for Neurotoxicity based on a single exposure does not constitute a data gap when data for repeated exposures are available.

**(N-repeat) Group II\* Score (repeated dose: H, M, L): *L***

Melamine cyanurate was assigned a score of LOW for Neurotoxicity based on a low score within the EPA's DfE alternatives assessment. This conclusion within the DfE report was estimated based on professional judgment. The low designation in both GreenScreen and EPA's alternatives assessment is based on the same measured endpoints. The score was based on expert judgment within EPA's Alternatives assessment and therefore is reported in italics within the GreenScreen assessment.

The summary provided within the EPA's alternatives assessment was as follows:

LOW: Estimated to not have potential for neurotoxicity based on expert judgment.

**Skin Sensitization (SnS) Group II\* Score (H, M or L): *M***

Melamine cyanurate was assigned a score of MODERATE for Skin Sensitization. While the low designation for skin sensitization in both GreenScreen and EPA's alternatives assessment is based on the same measured endpoints, there was information reported for cyanurate which was a borderline or mild sensitizer to guinea pigs. The score was based on data for cyanurate within EPA's alternatives assessment and therefore is reported in italics within the GreenScreen assessment.

The summary provided within the EPA's alternatives assessment was as follows:

LOW: Estimated based on evidence of mild skin sensitization following exposure to the dissolution product cyanuric acid. Melamine, also a dissolution product of melamine cyanurate, was not a skin sensitizer to humans or guinea pigs. There was no data located for melamine cyanurate for skin sensitization.

**Respiratory Sensitization (SnR) Group II\* Score (H, M or L): DG**

Melamine cyanurate was assigned a score of DATA GAP for Respiratory Sensitization. This conclusion was made based on no data located.

**Skin Irritation/Corrosivity (IrS) Group II Score (vH, H, M or L): *L***

Melamine cyanurate was assigned a score of LOW for Skin Irritation/Corrosivity based on tests results provided within the EPA's DfE alternatives assessment which indicates melamine polyphosphate is not irritating in rabbit skin tests. DfE categorizes melamine polyphosphate as a very

low eye irritant which corresponds to a low score under GreenScreen Eye Irritation/Corrosivity. The score was based on empirical data within EPA's alternatives assessment for an analog and therefore is reported in *italics* within the GreenScreen assessment.

The summary provided within the EPA's alternatives assessment was as follows:

VERY LOW: Melamine polyphosphate is not a skin irritant.

**Eye Irritation/Corrosivity (IrE) Group II Score (vH, H, M or L): *M***

Melamine cyanurate was assigned a score of MODERATE for Eye Irritation based on tests results provided within the EPA's DfE alternatives assessment which indicates melamine cyanurate is a mild-to-moderate eye irritant in rabbits. DfE categorizes melamine cyanurate as a low eye irritant which corresponds to a moderate score under GreenScreen Eye Irritation/Corrosivity. The score was based on data for melamine and cyanuric acid within EPA's alternatives assessment as no data specific to melamine cyanurate was located. Therefore the score is reported in *italics* within the GreenScreen assessment.

The summary provided within the EPA's alternatives assessment was as follows:

LOW: Estimated based on mild-to-moderate irritation to rabbit eyes following exposure to the dissolution products melamine and cyanuric acid. There was no data located for melamine cyanurate for eye irritation.

**Ecotoxicity (Ecotox)**

**Acute Aquatic Toxicity (AA) Score (vH, H, M or L): *L***

Melamine cyanurate was assigned a score of LOW for Acute Aquatic Toxicity. The low designation for acute aquatic toxicity in both GreenScreen and EPA's alternatives assessment is based on the same measured endpoints. The score was based on values from experimental data reported for melamine and cyanuric acid and professional judgment based on the low solubility of melamine cyanurate. While some acute toxicity values within EPA's alternatives assessment indicate a moderate to high acute aquatic toxicity, these values were estimated based on anilines and aromatic triazines. Adequate experimental data was available for all trophic levels to assign a low hazard score. The score was based on empirical data within EPA's alternatives assessment for melamine and cyanuric acid but professional judgment for melamine cyanurate and therefore is reported in *italics* within the GreenScreen assessment.

The summary provided within the EPA's alternatives assessment was as follows:

LOW: Melamine cyanurate has low water solubility and therefore it is estimated that it will display no effects at saturation (NES) because the amount dissolved in water is not anticipated to reach a concentration at which adverse effects may be expressed. A low hazard concern is also assigned for the dissociation products, melamine and cyanuric acid, based on experimental data.

**Chronic Aquatic Toxicity (CA) Score (vH, H, M or L): *L***

Melamine cyanurate was assigned a score of LOW Chronic Aquatic Toxicity. The low designation for chronic aquatic toxicity in both GreenScreen and EPA's alternatives assessment is based on the same measured endpoints. The score was based on values from experimental data reported in both fish and invertebrates for melamine and cyanuric acid and professional judgment for melamine cyanurate. While some estimated chronic algal toxicity values within EPA's alternatives assessment indicate a high chronic aquatic toxicity, these values were estimated based on anilines and aromatic triazines. Adequate experimental data was available for all trophic levels to assign a low hazard



score. The score was based on professional judgment and therefore is reported in italics within the GreenScreen assessment.

The summary provided within the EPA's alternatives assessment was as follows:

LOW: Melamine cyanurate has low water solubility and therefore it is estimated that it will display NES because the amount dissolved in water is not anticipated to reach a concentration at which adverse effects may be expressed. A low hazard concern is also for assigned for the dissociation products, melamine and cyanuric acid, based on experimental data.

### **Environmental Fate (Fate)**

#### **Persistence (P) Score (vH, H, M, L, or vL): vH**

Melamine cyanurate was assigned a score of VERY HIGH for Persistence. Information provided within the EPA's alternatives assessment indicates both measured and estimated values of persistence for melamine cyanurate and melamine fall within the very high score for this endpoint. The hazard score is based on empirical data values within EPA's alternatives assessment and therefore is not reported in italics within the GreenScreen assessment.

The summary provided within the EPA's alternatives assessment was as follows:

VERY HIGH: Based on an experimental biodegradation study (OECD 301B) that demonstrated it was not readily biodegradable. This result is consistent with its negligible water solubility suggesting it is not likely to be readily assimilated by microorganisms. Other degradative processes are not expected to be operative under environmental conditions. Melamine cyanurate is not expected to undergo complete dissolution under neutral conditions, nor under the pH levels typically found in the environment. However, it rapidly dissociates under pH extremes. It is least soluble at pH 5 but most soluble at pH 3.5 and below. Melamine cyanurate does not contain chromophores that absorb at wavelengths >290 nm, indicating that it is not expected to be susceptible to direct photolysis by sunlight. The dissociation products, melamine and cyanuric acid salts, have experimental studies indicating that they are not expected to biodegrade under aerobic conditions when assessed as their corresponding neutral organic components. However, experimental studies indicate that cyanuric acid may degrade in anoxic environs.

#### **Bioaccumulation (B) Score (vH, H, M, L, or vL): vL**

Melamine cyanurate was assigned a score of VERY LOW for Bioaccumulation. The low designation for bioaccumulation in EPA's alternatives assessment is equivalent to a very low score in GreenScreen. The score was based on estimated BCF values for melamine cyanurate and measured BAF and BCF values for melamine and cyanuric acid and therefore is reported in italics within the GreenScreen assessment.

The summary provided within the EPA's alternatives assessment was as follows:

LOW: Melamine cyanurate has negligible water solubility under near neutral conditions and is expected to have poor bioavailability resulting in low potential for bioaccumulation. In addition, experimental BCF data for the organic components of melamine cyanurate, melamine and cyanuric acid are <100. These experimental values also indicate a low potential for bioaccumulation.

### **Physical Hazards (Physical)**

#### **Reactivity (Rx) Score (vH, H, M or L): L**

Melamine cyanurate was assigned a score of LOW for Reactivity. EPA does not assess reactivity as one of its hazard criteria and, therefore, no data were available in the EPA assessment to address this criterion. Several Material Safety Data Sheets were available<sup>16</sup> and all reported that the plastic decomposed when heated and that no reactivity concerns exist for this polymer. Based upon this information and professional judgment, the reviewer believes a score of 'low' is appropriate.

**Flammability (F) Score (vH, H, M or L): L**

Melamine cyanurate was assigned a score of LOW for Flammability based on a not flammable description within the DfE report. This conclusion was based on adequate data and is not reported in italics.

**References** (may be provided under each hazard endpoint or at the end of document)

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<sup>16</sup> BASF Safety Data Sheet, for example, available at:  
[http://www.plasticsportal.net/wa/EU~pl\\_PL/Catalog/ePlastics/doc4/BASF/PRD/30045639/.pdf?title=&asset\\_type=msds/pdf&language=EN&validArea=REG\\_EU&urn=urn:documentum:ProductBase\\_EU:09007af8800018d7.pdf](http://www.plasticsportal.net/wa/EU~pl_PL/Catalog/ePlastics/doc4/BASF/PRD/30045639/.pdf?title=&asset_type=msds/pdf&language=EN&validArea=REG_EU&urn=urn:documentum:ProductBase_EU:09007af8800018d7.pdf),  
accessed 9/2013.

**APPENDIX A: Hazard Benchmark Acronyms  
(alphabetical order)**

- (AA) Acute Aquatic Toxicity**
- (AT) Acute Mammalian Toxicity**
- (B) Bioaccumulation**
- (C) Carcinogenicity**
- (CA) Chronic Aquatic Toxicity**
- (Cr) Corrosion/ Irritation (Skin/ Eye)**
- (D) Developmental Toxicity**
- (E) Endocrine Activity**
- (F) Flammability**
- (IrE) Eye Irritation/Corrosivity**
- (IrS) Skin Irritation/Corrosivity**
- (M) Mutagenicity and Genotoxicity**
- (N) Neurotoxicity**
- (P) Persistence**
- (R) Reproductive Toxicity**
- (Rx) Reactivity**
- (SnS) Sensitization- Skin**
- (SnR) Sensitization- Respiratory**
- (ST) Systemic/Organ Toxicity**