

GreenScreen® Assessment for [Melamine Polyphosphate (CAS#15541-60-3)]

Method Version: GreenScreen® Version 1.2¹

Verified or Non-Verified²: NON-VERIFIED

Introduction^{3,4,5}

This GreenScreen assessment is based on the information reported in the corresponding chemical hazard profile in “An Alternatives Assessment for the Flame Retardant Decabromodiphenyl ether (DecaBDE) Final Report”³. 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”⁴ and the GreenScreen for Safer Chemicals v1.2 methods⁵. 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*⁶: (List any deviations)

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

¹ Use GreenScreen® Assessment Procedure (Guidance) V1.2

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

³ An Alternatives Assessment for the Flame Retardant Decabromodiphenyl ether (DecaBDE) Final Report Available at: <http://www.epa.gov/dfe/pubs/projects/decaBDE/deca-report-complete.pdf>, p 4-433, accessed 2/9/2014.

⁴ Available at: http://www.epa.gov/dfe/alternatives_assessment_criteria_for_hazard_eval.pdf, accessed 10/2013.

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

⁶ See GreenScreen Guidance V1.2 Section 8

Chemical Name (CAS #):

Melamine Polyphosphate (CAS#15541-60-3)

Also Called:

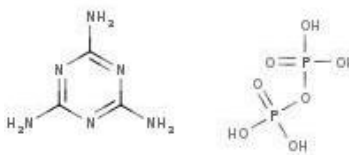
Diphosphoric acid, compound with 1,3,5-triazine-2,4,6-triamine; Polyphosphoric acids, compounds with melamine. The CASRN for the compound melamine pyrophosphate is on the TSCA inventory, 15541-60-3. The CASRN 218768-84-4 is associated with the product Melapur 200, not the chemical melamine polyphosphate

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

Confidential structurally similar polymers; Polyphosphoric acid (8017-16-1) and melamine (108-78-1) are the dissociated components of this salt

Chemical Structure(s):

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



Notes related to production specific attributes⁷:

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

Define Properties:

1. Particle size (e.g., silica of respirable size)
2. Structure (e.g., amorphous vs. crystalline)
3. Mobility (e.g., water solubility, volatility)
4. Bioavailability: Melamine polyphosphate is estimated to have a low oral, dermal, and inhaled absorption and distribution based on physical and chemical properties.

For Polymeric Materials: (delete this section if not a polymeric material)

Identify Monomers and Corresponding Properties⁸

From the DfE report, “This alternative contains a polymeric moiety. Although the chain length of the polyphosphoric acid is not specified, the smaller, water-soluble polyphosphate ions were used in assessment (generally as the diphosphate ion, n=1). Melamine polyphosphate will freely dissociate under environmental conditions. Measured values from studies on the dissociated components were used to supplement data gaps as appropriate and EPI v 4.0 was used to estimate physical/chemical and environmental fate values in the absence of experimental data. Measured values from experimental studies were incorporated into the estimations.”

⁷ 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 #.

⁸ While melamine polyphosphate is a polymer, information to address these items is not available in the DfE report.

“Melamine polyphosphate is a complex mixture consisting of melamine and polyphosphate chains of varying length.”⁹

Information to address the following section is not available in the DfE report.

1. % of Each Monomer
 - a) Monomer 1
 - b) Monomer 2
 - c) Monomer 3
2. Are the monomers blocked? (Y/N)
3. Molecular Weight (MW) of polymeric material
4. % of polymeric material with
 - a) MW <500
 - b) MW <1,000
5. % Weight Residual Monomers
6. Solubility/Dispersability/Swellability
7. Particle size
8. Overall charge of polymeric material
9. Identify constituents and residual concentrations of
 - a) Catalysts
 - b) Processing aids
10. Identify any monomers, oligomers, catalysts or processing aids classified as Benchmark 1 according to the hazard identification lists in the GreenScreen List Translator.

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

1. Flame Retardant

GreenScreen Benchmark Score and Hazard Summary Table:^{10,11,12,13}

Melamine polyphosphate was assigned a **Benchmark Score of 2** based on moderate Group I human toxicity endpoints (carcinogenicity and mutagenicity); and moderate Group II human toxicity endpoints (acute mammalian toxicity, repeat dose systemic toxicity, and eye irritation) in addition to a very high persistence.

Melamine polyphosphate could be a Benchmark 1 if the data gap for endocrine activity or respiratory sensitization was filled with data indicating a high hazard score.

Melamine polyphosphate could be a Benchmark 1_{TP} if melamine is determined to be feasible and relevant and Benchmark 1.

⁹ An Alternatives Assessment for the Flame Retardant Decabromodiphenyl ether (DecaBDE) Final Report
Available at: <http://www.epa.gov/dfe/pubs/projects/decaBDE/deca-report-complete.pdf>, p 4-433, accessed 2/9/2014.

¹⁰ See Appendix A for a glossary of hazard endpoint acronyms

¹¹ See Appendix B for alternative GreenScreen Hazard Summary Table (Classification presented by exposure route)

¹² For inorganic chemicals only, see GreenScreen Guidance V1.2 Section 14.4. (Exceptions for Persistence)

¹³ 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.

Green Screen Hazard Ratings: [<i>Melamine polyphosphate</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>L</i>	<i>L</i>	DG	<i>M</i>		<i>M</i>		<i>L</i>	<i>L</i>	DG	<i>L</i>	<i>M</i>	<i>L</i>	<i>L</i>	<i>vH</i>	<i>vL</i>	<i>L</i>	<i>L</i>

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 Ratings¹⁴:

Identify feasible and relevant environmental transformation products (i.e., dissociation products, transformation products, valence states) and/or moieties of concern¹⁵

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)

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 polyphosphate 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.

¹⁴ See GreenScreen Guidance V1.2 Section 13

¹⁵ 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.

The summary provided within the EPA's alternatives assessment was summarized as follows:
MODERATE: Estimated based on the dissolution product melamine. There is experimental evidence that oral melamine exposure causes carcinogenicity in animals; however, no data were located to support its carcinogenicity in humans. Tumor formation in animals appeared to happen in a mechanical nature under conditions in which it produced bladder calculi. No carcinogenicity data for melamine polyphosphate were located. IARC classifies melamine as Group 3: not classifiable as to its carcinogenicity to humans.

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

Melamine polyphosphate 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 and therefore is reported in italics within the GreenScreen assessment.

The summary provided within the EPA's alternatives assessment was summarized as follows:
MODERATE: Melamine polyphosphate is estimated to be a moderate hazard concern for genotoxicity based on the data for melamine. For melamine, positive results were observed for in vivo chromosome aberration and sister chromatid exchange assays conducted by NTP in 1988 and 1989. Available in vitro genotoxicity testing was conducted with metabolic activation systems from the liver. NTP suggests this may not account for potential activation from bladder epithelial cells, which is the target organ. Proposed genotoxicity testing using a metabolic activation system from bladder epithelial cells (NTP, 1983) was never conducted (Personal Communication, 2007; 2008).

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

Melamine polyphosphate was assigned a score of LOW for Reproductive Toxicity based on a low 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. DfE's low score was based on expert judgment. While there was one study included within EPA's alternatives assessment which indicated an associated reproductive toxicity for melamine polyphosphate this study which was not in English provided no details and therefore was not included within the score. 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 summarized as follows:
LOW: Estimated based on analogy to structurally similar polymers and professional judgment.

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

Melamine Polyphosphate was assigned a score of LOW for Developmental Toxicity based on a low 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 based on melamine 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: Melamine polyphosphate is estimated to be of low hazard concern for developmental effects based on the data for melamine. For melamine, no adverse effects on gestational parameters, no signs of developmental toxicity.

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

Melamine Polyphosphate 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 to describe the effect of melamine polyphosphate on the endocrine system.

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

There were insufficient data located to describe the effect of melamine polyphosphate 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): M

Melamine polyphosphate was assigned a score of MODERATE for Acute Mammalian Toxicity. The basis for acute mammalian toxicity classification in both the EPA's DfE and GreenScreen is based on the same measured endpoints. While the EPA's alternatives assessment gives melamine polyphosphate a low rating, the information provided within the DfE report indicate the chemical fulfills the moderate hazard score under the GreenScreen methodology. Specifically DfE reports melamine to have an inhalation LC₅₀ of 3.2 mg/L. The score was based on a study with limited details 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 summarized as follows:

LOW: Melamine polyphosphate is expected to be of low hazard for acute toxicity based on experimental evidence for melamine polyphosphate, phosphoric acids and melamine. The weight of evidence indicates that when administered orally and dermally to rats, mice and rabbits, melamine polyphosphate, polyphosphoric acid, and melamine do not produce substantial mortality at levels up to 1,000 mg/kg.

Systemic Toxicity/Organ Effects incl. Immunotoxicity (ST) (ST-single) Group II Score (single dose: vH, H, M or L): N/A

Melamine polyphosphate 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): *M*

Melamine polyphosphate was assigned a score of MODERATE for Systemic Toxicity/Organ Effects based on repeated exposure. The moderate 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 score was based on data for melamine 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: Melamine polyphosphate is expected to be a moderate hazard for repeated dose effects based on the data for melamine. Stones and diffuse epithelial hyperplasia in the urinary bladders were observed in male rats at doses as low as 700 ppm (72 mg/kg/day).

In addition:

Potential for immunotoxic effects based on analogy to structurally similar polymers.

Neurotoxicity (N)

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

Melamine polyphosphate 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 polyphosphate 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 analogy and 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: Based on professional judgment through analogy to structurally similar polymers.

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

Melamine Polyphosphate was assigned a score of LOW for Skin Sensitization. This conclusion was made based on information reported for melamine which is non-sensitizing to guinea pigs. The low

designation for skin sensitization in both GreenScreen and EPA's alternatives assessment is based on the same measured endpoints. The score was based on data for melamine 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 summarized as follows:

LOW: Melamine polyphosphate is not expected to be a skin sensitizer based on the data for melamine.

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

Melamine Polyphosphate 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 polyphosphate 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 and therefore is not reported in italics within the GreenScreen assessment.

The summary provided within the EPA's alternatives assessment was summarized 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 polyphosphate was assigned a score of MODERATE for Eye Irritation based on tests results provided within the EPA's DfE alternatives assessment which indicates melamine polyphosphate is a slight eye irritant in rabbits. DfE categorizes melamine polyphosphate as a low eye irritant which corresponds to a moderate score under GreenScreen Eye Irritation/Corrosivity. The score was based on 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:

LOW: Melamine polyphosphate is slightly irritating to eyes.

Ecotoxicity (Ecotox)

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

Melamine polyphosphate 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 melamine polyphosphate. While some acute toxicity values within EPA's alternatives assessment indicate a moderate acute aquatic toxicity, these values were estimated based on anilines. Estimates for melamines indicated a low acute hazard. 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 and therefore is not reported in italics within the GreenScreen assessment.

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

LOW: Melamine polyphosphate is expected to be of low hazard for acute toxicity to aquatic organisms based on experimental data for melamine polyphosphate and experimental data for melamine. For melamine, the weight of evidence suggests that the acute values are >100 mg/L. For melamine polyphosphate, no effects were observed at the highest concentration tested (3.0 mg/L). Melamine polyphosphate does not cause eutrophication.

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

Melamine polyphosphate was assigned a score of LOW for 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. While one estimated chronic algal toxicity values within EPA's alternatives assessment indicate a high chronic aquatic toxicity, these values were estimated based on anilines. The estimated value for melamines indicated a low chronic hazard. 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 summarized as follows:
LOW: Melamine polyphosphate is expected to be of low hazard for chronic toxicity to aquatic organisms based on experimental data for melamine. For melamine, the weight of evidence suggests that the chronic values are >10 mg/L.

Environmental Fate (Fate)

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

Melamine polyphosphate was assigned a score of VERY HIGH for Persistence. While the EPA's alternatives assessment gives melamine polyphosphate a high rating, the information provided within the DfE report indicate the chemical fulfills the very high hazard score. The score was based on estimates of melamine polyphosphate half-lives in air exceeding 5 days and estimated half-lives in lakes and rivers of greater than 1 year. The hazard score is based on estimated values 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 summarized as follows:
HIGH: Melamine polyphosphate is expected to show high persistence in the environment based on the data for melamine, which is expected to be fully dissociated under environmental conditions. The weight of evidence suggests that melamine will biodegrade, but not rapidly. Degradation of melamine or its cation by hydrolysis or direct photolysis is not expected to be significant as the functional groups present on this molecule do not tend to undergo these reactions under environmental conditions. Polyphosphoric acid is expected to have low persistence in the environment. The weight of evidence suggests that polyphosphoric acid will hydrolyze under environmental conditions. The phosphates formed are expected to participate in natural cycles and be readily assimilated.

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

Melamine polyphosphate 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 measured BAF and BCF values and therefore is not reported in italics within the GreenScreen assessment.

The summary provided within the EPA's alternatives assessment was summarized as follows:
LOW: Based on the relatively high water solubility of melamine polyphosphate (20 g/L) and an estimated BCF of 3.2. In addition, the experimental bioconcentration values for the melamine component are low, BCF <3.8, and estimated BAF <1.

Physical Hazards (Physical)

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

Melamine polyphosphate was assigned a score of LOW for Reactivity. EPA does not assess reactivity as one of its hazard criteria and, therefore, no data was available in the EPA assessment to address this criterion. However, evaluation of available Material Safety Data Sheets¹⁶ indicated melamine polyphosphate is neither reactive nor explosive. 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 polyphosphate 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)

¹⁶ Example MSDS available at: http://www.hummelcroton.com/msdspdf/mpp_m.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**