Updated Results of Polyhalogenated Dibenzo-*p*-Dioxin/Dibenzofuran Testing and Reporting Under the Toxic Substances Control Act (TSCA)

Todd S. Holderman[A] and P. H. Cramer[B]

[A] United States Environmental Protection Agency, Office of Pollution Prevention and Toxics, 401 M Street, S.W., Washington, DC 20460, USA

[B] Midwest Research Institute, 425 Volker Boulevard, Kansas City, MO 64110, USA

Introduction

The United States Environmental Protection Agency (USEPA) recognizes the potential public health and environmental significance of a variety of polyhalogenated dibenzo-*p*-dioxins (PHDDs) and dibenzofurans (PHDFs).

As a result, the USEPA has undertaken activities to assess and, as appropriate, control the risks posed by PHDDs and PHDFs. A fundamental requirement for the risk assessment is

the determination of PHDD and PHDF levels in certain existing chemicals as well as chemicals that are likely to be produced in the future.

In 1987, the USEPA, under the authority granted by Sections 4 and 8 of the Toxic Substances Control Act (TSCA), promulgated a testing and reporting Rule (40 *CFR* 766) for selected chlorinated or brominated chemicals that are structurally related to dioxins and furans (Table 1). Manufacturers or importers of these chemicals are required to submit analytical testing protocols for approval by USEPA and to carry out testing to determine whether the chemicals contain 2,3,7,8-substituted halogenated dioxins and furans at levels above limits of quantitation (LOQ) set forth in the Rule (Table 2).

Table 1. Chemicals Undergoing Testing

Chemical Name	CAS No.
2,4-Dichlorophenol	120-83-2
2,3,5,6-Tetrachloro-2,5-cyclohexadiene-1,4-dione	118-75-2
Decabromodiphenyl oxide	1163-19-5
Octabromodiphenyl oxide	32536-52-0
Pentabromodiphenyl oxide	32534-81-9
Tetrabromobisphenol-A	79-94-7
2,4,6-Tribromophenol	118-79-6
Tetrabromobisphenol-A-bisethoxylate	4162-45-2
Allyl ether of tetrabromobisphenol-A	25327-89-3
1,2-Bis(tribromophenoxyl)ethane	37853-59-1

Table 2. Limits of Quantitation (LOQs) Required by the Rule

Isomer	LOQ (ppb)
Tetra-PHDD	0.1
Penta-PHDD	0.5
Hexa-PHDD	2.5
Hepta-PHDD	100
Tetra-PHDF	1.0
Penta-PHDF	5.0
Hexa-PHDF	25
Hepta-PHDF	1000

Status of Test Rule Activities

Sixteen testing submissions (sampling and analytical protocols) and testing data for the eight brominated chemicals shown in Table 1 have been received by USEPA. Data from fifteen submissions has been accepted. One submission is currently under review.

Table 3 summarizes the results of the brominated commercial product analyses where the data were found to be acceptable. Some PHDD/PHDF isomers were detected above the

test rule LOQs in octabromodiphenyl oxide and pentabromodiphenyl oxide products. All other products did not contain PHDD/PHDF levels above the test rule LOQs but did contain detectable amounts of selected isomers.

Data on one chlorinated product (chloranil) remains to be submitted. Previous submissions for chloranil indicated that this substance is contaminated by PHDDs and PHDFs. Industry has implemented changes that appear to dramatically reduce the PHDD and PHDF levels in this product. The USEPA anticipates two submittals from producers of "low dioxin" chloranil. The USEPA has approved the sampling and analysis protocol for one submitter and has received a data package for review. The other submitter must address issues in their analytical protocol before testing can begin.

Table 3: PBDD and PBDF Concentrations in Selected Brominated Commercial Products Isomer Concentration (ng/g)

	Decabromodiphenyl oxide			Octabromodiphenyl oxide			Pentabromodiphenyl oxide	
Isomer	Great Lakes	Ethyl	Ameribrom	Great Lakes	Ethyl	Ameribrom	Great Lakes	Ameribrom
2,3,7,8-TBDD	ND[a]	ND	ND	ND	ND-0.71	ND	ND	ND
1,2,3,7,8-PeBDD	ND-0.1	ND	ND	ND-0.1	ND	ND	0.3-5.9[c]	ND-0.3
1,2,3,4,7,8/1,2,3,6,7,8-HxBDD	ND-0.5	ND	ND	ND	ND	ND	ND	5.3-6.8
1,2,3,7,8,9-HxBDD	ND	ND-0.76	ND	ND	ND	ND	ND	ND-0.02
1,2,3,4,6,7,8-HpBDD	ND	ND	ND	ND	ND	ND	ND	ND
2,3,7,8-TBDF	ND	ND	ND	ND-0.1	ND-12.6	ND	ND-3.1	ND-0.1
1,2,3,7,8-PeBDF	ND	ND-0.7	ND	ND	ND-6.3	ND	4.9-10.2	0.7-2.4
2,3,4,7,8-PeBDF	ND	ND	ND	ND-0.5	ND-83.1	ND	0.2-2.9	0.1-0.2
1,2,3,4,7,8/1,2,3,6,7,8-HxBDF	ND-0.8	ND-0.38	ND-0.6	ND-2.5	3.5-67.8	ND	15.6-46.9	15.6-61.2
2,3,4,6,7,8-HxBDF	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,7,8,9-HxBDF	ND	ND	ND	ND	1.7-56.0	ND	ND	ND
1,2,3,4,6,7,8-HpBDF	41.7-68.6	80.5-186	17-68.9	160-302	125-Sat[b]	217-330	0.4-1.2	0.7-3.0
1,2,3,4,7,8,9-HpBDF	ND	ND	ND	ND	ND	ND	ND	ND

Table 3 (Continued)

Isomer	Tetrabromobisphenol-A			1,2-Bis-(tribromo-phenoxy) ethane	Tetrabromobisphenol-A-bisethoxylate	Allyl ether of tetra-bromobisphenol-A	2,4,6-Tribromophenol
	Great Lakes	Ethyl	Ameribrom	Great Lakes	Great Lakes	Great Lakes	Great Lakes
2,3,7,8-TBDD	ND	ND	ND	ND	ND	ND	ND
1,2,3,7,8-PeBDD	ND	ND	ND	ND	ND	ND	ND
1,2,3,4,7,8/ 1,2,3,6,7,8-HxBDD	ND	ND	ND	ND	ND	ND	ND
1,2,3,7,8,9-HxBDD	ND	ND	ND	ND	ND	ND	ND
1,2,3,4,6,7,8-HpBDD	ND	ND	ND	ND	ND	ND	ND
2,3,7,8-TBDF	ND	ND	ND	ND-0.04	ND	ND	ND
1,2,3,7,8-PeBDF	ND	ND	ND	ND	ND	ND	ND
2,3,4,7,8-PeBDF	ND	ND	ND	ND	ND	ND	ND
1,2,3,4,7,8/ 1,2,3,6,7,8-HxBDF	ND	ND	ND	ND-0.03	ND	ND	ND
2,3,4,6,7,8-HxBDF	ND	ND	ND	ND	ND	ND	ND
1,2,3,7,8,9-HxBDF	ND	ND	ND	ND	ND	ND	ND
1,2,3,4,6,7,8-HpBDF	ND	ND	ND	ND-0.33	ND	ND	ND
1,2,3,4,7,8,9-HpBDF	ND	ND	ND	ND	ND	ND	ND

[a] Not detected.
[b] Saturated responses in some replicates.
[c] Failed isotope ratio requirements.