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TO: Official Correspondents, North American
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FROM: Art Dungan *Art Dungan*

DATE: September 27, 1989

SUBJECT: VCM Production as a Source of Dioxin and Furans

Attached is an abstract of a paper on the above subject presented at
the Ninth International Symposium on Chlorinated Dioxin and Related
Compounds in Toronto on September 22, 1989.

AED/RGS/tk

SL 105614

September 26, 1989

CATALYTIC OXYCHLORINATION PROCESSES OF ALIPHATIC HYDROCARBONS AS
NEW INDUSTRIAL SOURCES OF PCDDs AND PCDFs

(Laboratory of Environmental and Toxicological Chemistry, University of Amsterdam, Nieuw
Achtergracht 166, 1018WV Amsterdam, The Netherlands)

In the last few years extensive sediment and waste water monitoring studies in the river Rhine
area have been performed with special attention to industrial sources of PCDDs and PCDFs.

From these studies it was concluded that hitherto not recognized industrial sources contributed
significantly to the pollution of the Dutch river delta with these compounds. The
PCDD/PCDF isomer patterns and spatial variations of their relative levels indicated
vinylchloride monomer (VCM) production as a principal source for PCDDs and especially
PCDFs. Analysis of process and waste water, sampled at various points in the VCM production
process confirmed these indications. The crucial step was found to be the oxychlorination of
ethylene to 1,2 - dichloroethane catalyzed by alumina-CuCl₂ at 250 - 300 degrees centigrade.
At the laboratory the oxychlorination process and the effect of various reaction parameters
(catalyst content and pretreatment, temperature and input gas flows) on the formation of
PCDDs, PCDFs and some precursors (polychlorinated biphenyls, -benzenes and -styrenes) was
studied. It was established that transition metal halogenides play a key role in the high
temperature formation of the halogenated DDs and DFs and an attempt is made to elucidate
the major formation mechanisms.

* L. Charles uses CuCl₂ on clay carrier. Otherwise, this is the same as
our process @ L. Ch.

Probably a good chance that these may be formed in the OHC
and Per/Tri processes @ L. Ch. Could be in the process
waste water leaving the plant.

SL 105615

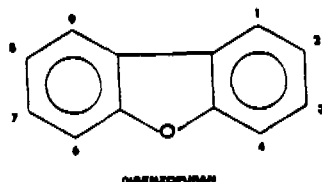
22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS



PCDF poly chlorinated dibenzo furan
" " " dioxin

PCDF Poly chlorinated Dibenzo furan
PCDD " " " Dioxin.

CHLORINATED DIBENZOFURANS ††



CHLORINATED DIBENZOFURANS (98-99% Pure)

RPE-022	Dibenzofuran	\$ 15/50mg	\$ 10/1mL
RPE-030	2-Chlorodibenzofuran	\$ 67/ 5mg	\$ 25/1mL
RPE-031	4-Chlorodibenzofuran	\$ 67/ 5mg	\$ 25/1mL
RPE-032	2,4-Dichlorodibenzofuran	\$100/ 1mg	\$ 45/1mL
RPE-033	2,6-Dichlorodibenzofuran	\$100/ 1mg	\$ 45/1mL
RPE-018	2,8-Dichlorodibenzofuran	\$100/10mg	\$ 45/1mL
RPE-038	1,2,3-Trichlorodibenzofuran	\$100/ 1mg	\$ 45/1mL
RPE-036	2,3,8-Trichlorodibenzofuran	\$100/ 1mg	\$ 45/1mL
RPE-034	2,4,6-Trichlorodibenzofuran	\$100/ 1mg	\$ 45/1mL
RPE-035	2,4,8-Trichlorodibenzofuran	\$100/ 1mg	\$ 45/1mL
RPE-039	1,2,3,4-Tetrachlorodibenzofuran*	\$400/ 1mg	\$200/1mL
RPE-040	1,3,7,8-Tetrachlorodibenzofuran*	\$400/ 1mg	\$200/1mL
RPE-037	2,3,7,8-Tetrachlorodibenzofuran*	\$500/ 1mg	\$250/1mL
RPE-041	1,2,3,4,8-Pentachlorodibenzofuran*	\$500/ 1mg	\$250/1mL
RPE-042	1,2,3,7,8-Pentachlorodibenzofuran*	\$700/ 1mg	\$350/1mL
RPE-043	1,2,3,4,7,8-Hexachlorodibenzofuran*	\$700/ 1mg	\$350/1mL
RPE-044	1,2,3,4,6,7,8-Heptachlorodibenzofuran*	\$700/ 1mg	\$350/1mL
RPE-018	Octachlorodibenzofuran	\$ 50/10mg	\$ 25/1mL

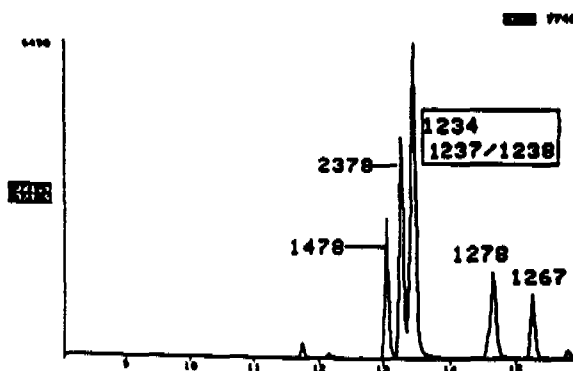
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DIOXIN and FURAN MIXTURES ††

EPA METHOD FOR 2,3,7,8-TCDD IN SOIL AND SEDIMENT:

This method is designed to monitor TCDD in soil samples via capillary GC/MS. The GC/MS system must demonstrate its capability of separating TCDD isomers eluting close to 2,3,7,8-TCDD once per 8 hour work shift. We have prepared a verification mixture having the following make up: 1,4,7,8-TCDD 100 ng; 1,2,7,8-TCDD 93ng; 1,2,6,7-TCDD 52ng; and 1,2,3,7-/1,2,3,8-; 2,3,7,8- and 1,2,3,4-TCDD 160ng each.

RPE-29M	TCDD isomer mix neat	\$250.00
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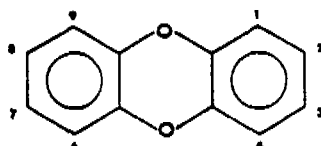


*GC/MS analysis data available, if requested at time of order.

**SOLUTIONS are available at 50 ug/mL in toluene, packaged in 1mL ampules.
Please add the suffix "S" to the catalog number when ordering.

††PCB packaging (Dot E-8240)

CHLORINATED DIBENZO-p-DIOXIN STANDARDS †† (98-99% Pure)



DIBENZO-p-DIOXIN

RPE-023	Dibenzo-p-dioxin	\$ 30/25mg	\$ 25/1mL
RPE-015	1-Chlorodibenzo-p-dioxin	\$ 37/25mg	\$ 25/1mL
RPE-016	2-Chlorodibenzo-p-dioxin	\$ 37/50mg	\$ 25/1mL
RPE-051	2,3-Dichlorodibenzo-p-dioxin	\$100/ 1mg	\$ 45/1mL
RPE-025	2,7-Dichlorodibenzo-p-dioxin	\$200/ 5mg	\$100/1mL
RPE-052	2,8-Dichlorodibenzo-p-dioxin	\$100/ 1mg	\$ 45/1mL
RPE-059	1,2,3-Trichlorodibenzo-p-dioxin	\$100/ 1mg	\$ 45/1mL
RPE-026	1,2,4-Trichlorodibenzo-p-dioxin	\$100/ 5mg	\$ 45/1mL
RPE-053	2,3,7-Trichlorodibenzo-p-dioxin*	\$350/ 1mg	\$150/1mL
RPE-027	1,2,3,4-Tetrachlorodibenzo-p-dioxin	\$100/25mg	\$ 90/1mL
RPE-054	1,3,6,8-Tetrachlorodibenzo-p-dioxin*	\$400/ 1mg	\$250/1mL
RPE-060	1,3,7,8-Tetrachlorodibenzo-p-dioxin*	\$400/ 1mg	\$250/1mL
RPE-029	2,3,7,8-Tetrachlorodibenzo-p-dioxin†	Inquire	\$ 55/1mL
RPE-055	1,2,3,4,7-Pentachlorodibenzo-p-dioxin*	\$400/ 1mg	\$250/1mL
RPE-056	1,2,3,7,8-Pentachlorodibenzo-p-dioxin*	\$400/ 1mg	\$250/1mL
RPE-057	1,2,4,7,8-Pentachlorodibenzo-p-dioxin*	\$400/ 1mg	\$200/1mL
RPE-058	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin*	\$500/ 1mg	\$250/1mL
RPE-061	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	\$800/ 1mg	\$350/1mL
RPE-062	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	\$800/ 1mg	\$350/1mL
RPE-063	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin*	\$400/ 1mg	\$250/1mL
RPE-017	Octachlorodibenzo-p-dioxin	\$100/10mg	\$100/1mL

†2,3,7,8-Tetrachlorodibenzo-p-dioxin solution is 10ug/mL in toluene.

BROMINATED DIBENZO-p-DIOXINS †† (98-99% Pure)

RPE-070	2-Bromodibenzo-p-dioxin*	\$500/mg	\$350/1mL
RPE-071	2,3-Dibromodibenzo-p-dioxin*	\$500/mg	\$350/1mL
RPE-072	1,2,3-Tribromodibenzo-p-dioxin*	\$500/mg	\$350/1mL
RPE-073	2,3,7-Tribromodibenzo-p-dioxin*	\$500/mg	\$350/1mL
RPE-074	1,2,3,4-Tetrabromodibenzo-p-dioxin*	\$500/mg	\$350/1mL
RPE-075	2,3,7,8-Tetrabromodibenzo-p-dioxin*	\$500/mg	\$350/1mL
RPE-076	1,2,3,7,8-Pentabromodibenzo-p-dioxin*	\$500/mg	\$350/1mL
RPE-077	1,2,3,4,7,8-Hexabromodibenzo-p-dioxin*	\$500/mg	\$350/1mL
RPE-078	Octabromodibenzo-p-dioxin*	\$500/mg	\$350/1mL

**NEED TECHNICAL INFORMATION?
CALL 401-828-9400**

*GC/MS analysis data available, if requested at time of order.

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Please add the suffix "S" to the catalog number when ordering.