DETERMINATION OF THE WEIGHT PERCENT HOMOLOG COMPOSITION OF AROCLOR 1016

INTRODUCTION

The weight percent homolog composition of Aroclor 1016 was determined using the chromatographic conditions stipulated in the official Environmental Protection Agency (EPA) procedure for the determination of PCBs in industrial effluents. The data are needed to estimate the percent PCBs present in Aroclor 1016 in accordance with the definition proposed to the EPA at the Toxic Pollutant Effluent Standards Hearing in Washington, D.C.

SUMMARY AND CONCLUSIONS

It was estimated by comparison with the EPA data for Aroclor 1242 that Aroclor 1016 contains 2.3% PCBs by the proposed definition.

RESULTS AND DISCUSSION

The gas chromatographic conditions employed were as follows:

Instrument: Hewlett Packard 5750 Research Chromatograph equipped with a high temperature ^{63}Ni electron capture detector.

Column: 6' X 4mm (glass) packed with 3% SE-30 on 80/100 Mesh Chromosorb W - HP.

Pulse Rate: 50μ sec.

Temperatures:

Injection Port: 210°C
Column: 190°C (Isothermal)
Detector: 330°C

Flow Rates:

Carrier: He 60 ml/min.
Purge: Ar/CH_4 (9/1), 120 ml/min.

The definition of PCBs proposed to the EPA is, "Polychlorinated biphenyls (PCBs) means materials containing the biphenyl group which is chlorinated and which have been shown to persist and rapidly bioaccumulate in the aquatic environment. These chlorinated biphenyls are identified as those components having gas chromatographic retention times greater than 60, relative to p,p'-DDE = 100, under the standard conditions recommended in the EPA PCB test method."

Figures 1 and 2 show the electron capture (EC) chromatograms of Aroclor 1242 and Aroclor 1016, respectively, with each peak labeled by retention time relative to p,p'-DDE = 100. The chromatographic conditions were adjusted such that the EC chromatogram of Aroclor 1242 was identical to that published in the EPA method.

The weight percent homolog composition of Aroclor 1242 is shown in Table I. This table was taken directly from the EPA method. These data indicate that Aroclor 1242 contains 23% PCBs by the proposed definition. The percent PCBs present in Aroclor 1016 can be closely estimated in the following manner from the chromatograms

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and the known weight percent composition of Aroclor 1242.

$$\% \text{ PCBs in Aroclor 1016} = \frac{A_{1016}}{A_{1242}} \times B$$

Where A_{1016} = the area of peak #70 from the EC chromatogram of Aroclor 1016

A_{1242} = the area of peak #70 from the EC chromatogram of Aroclor 1242

B = the weight percent represented by peak #70 in Aroclor 1242

% PCBs* in Aroclor 1016 = 1.8

If it is also assumed that the relative compositions of Aroclor 1242 and Aroclor 1016 are equivalent through peak #58, then the weight percent composition of Aroclor 1016 can be calculated and the level of PCBs present in this fluid adjusted by the appropriate factor.

$$\text{Normalized Mean Weight Percent} = \frac{100}{P_{1016(70)} + P_{1242(T)}} \times P$$

P = mean weight percent of each peak of Aroclor 1242 through peak #58

$P_{1016(70)}$ = % PCBs in Aroclor 1016 (un-normalized)

$P_{1242(T)}$ = total mean weight percent of all peaks of Aroclor 1242 through peak #58

Based on this data, Aroclor 1016 contains 2.3% PCBs. The normalized mean weight percent of each peak in Aroclor 1016 is shown in Table II.

*un-normalized

db

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FIGURE 1

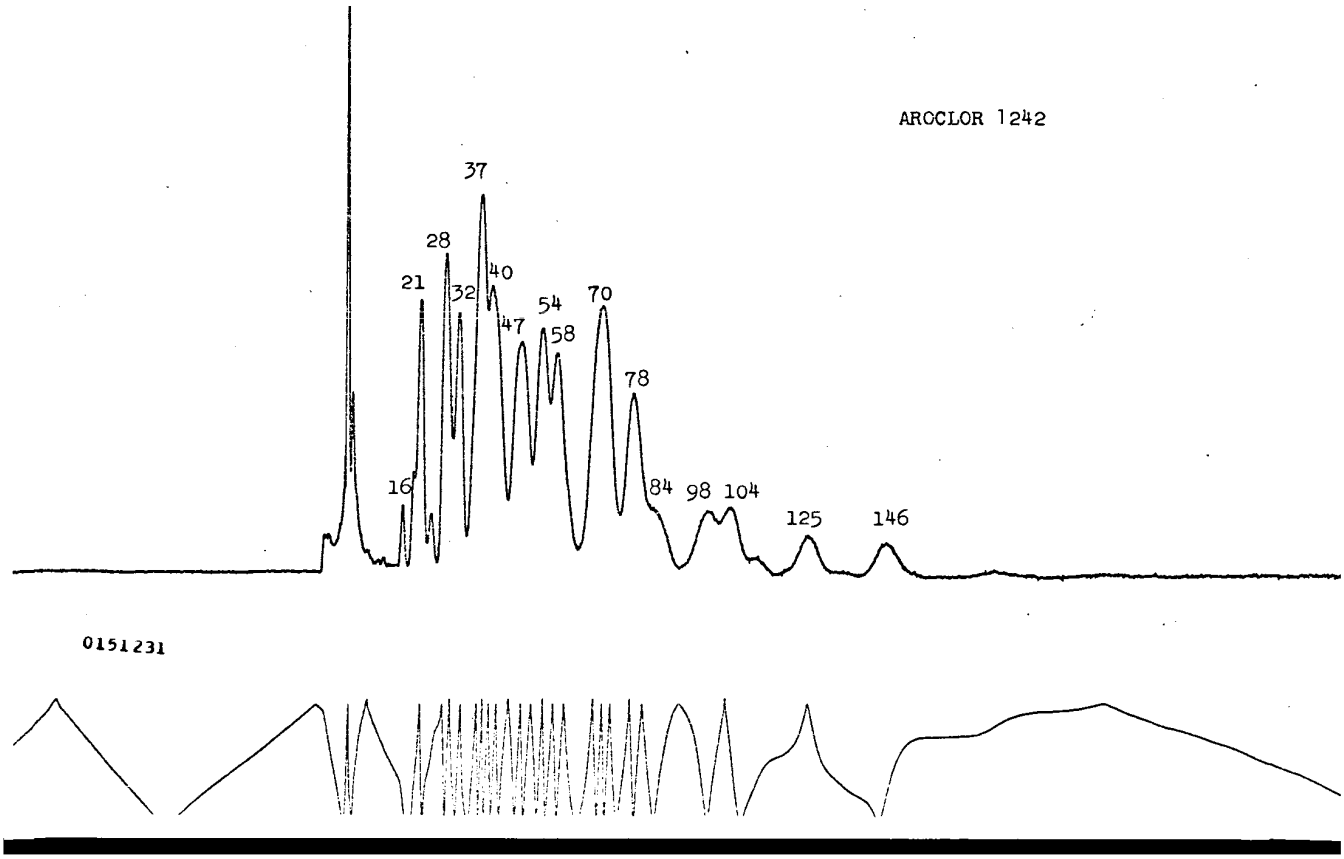

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FIGURE 2

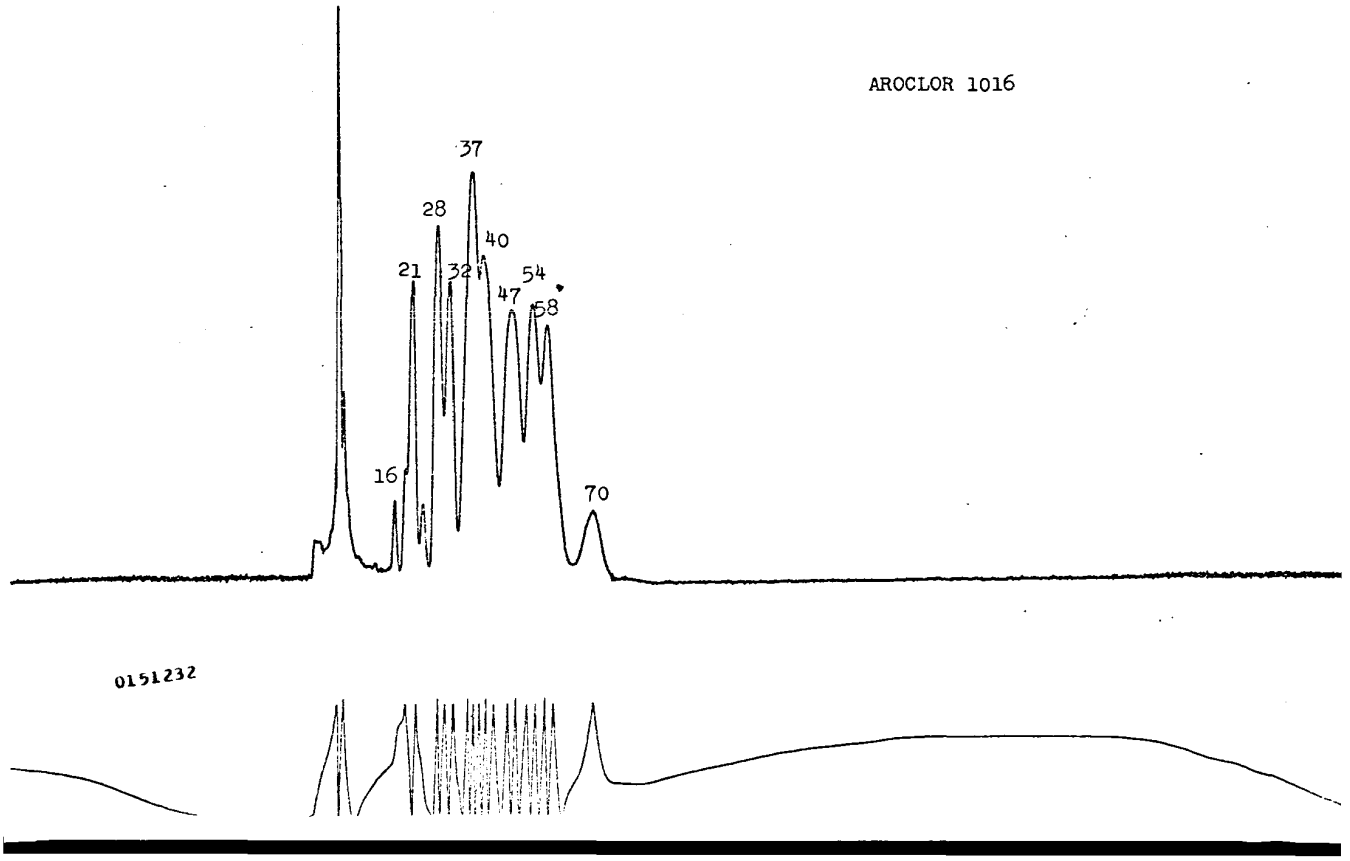

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TABLE I

COMPOSITION OF AROCLOR 1242

(Table 3, EPA Procedure)

RRT[a]	Mean Weight Percent	Number of Chlorines
11	1.1	1
16	2.9	2
21	11.3	2
28	11.0	2 (25%); 3 (75%)
32	6.1	3
37	11.5	3
40	11.1	3
47	8.8	4
54	6.8	3 (33%); 4 (67%)
58	5.6	4
70	10.3	4 (90%); 5 (10%)
78	3.6	4
84	2.7	5
98	1.5	5
104	2.3	5
125	1.6	5 (85%); 6 (15%)
146	1.0	5 (75%); 6 (25%)

(a) Retention time relative to p,p'-DDE = 100.
Measured from first appearance of solvent.

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TABLE II

CALCULATED COMPOSITION OF AROCLOR 1016

RRT[a]	Calculated Weight Percent	Number of Chlorines (From Table I)
11	1.4	1
16	3.7	2
21	14.5	2
28	14.1	2 (25%); 3 (75%)
32	7.8	3
37	14.7	3
40	14.2	3
47	11.3	4
54	8.7	3 (33%); 4 (67%)
58	7.2	4
70	2.3	4 (90%); 5 (10%)

[a] Same as Table I

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