US EPA ARCHIVE DOCUMENT

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Date Out EFB: 13 OCT 1982

FILE COPY

To: Product Manager Miller (16)
TS-767

From: Samuel M. Creeger, (Acting)
Chief, Review Section No. 1
Environmental Fate Branch

Attached please find the environmental fate review of:

Reg./File No.: 239-1633

Chemical: Naled (034401)

Type Product:

Product Name:

Company Name: Chevron

Submission Purpose: review photolysis data - not associated with a specific use

ZBB Code: ?

ACTION CODE: 400

Date in: 6/29/82

EFB # 384

Date Completed: 13 OCT 1982

TAIS (level II)	Days
67	4

Deferrals To:

_____ Ecological Effects Branch

_____ Residue Chemistry Branch

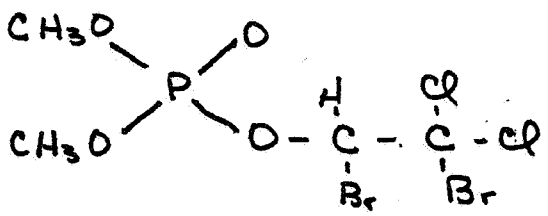
_____ Toxicology Branch

1.0 INTRODUCTION

Chevron has submitted a photodegradation study of naled in water using ultraviolet light. Acc. No. 247715.

2.0 Naled (technical)

1,2-dibromo-2,2-dichloroethyl dimethylphosphate



3.0 DISCUSSION

"Photodegradation of (Ethyl-1-^{14}C) Naled in Water by Long Wavelength U.V. Light," Y. S. Chen, Chevron Chemical, March 30, 1982.

^{14}C-naled (0.8 mg in 0.36 ml acetone) was added to 400 ml deionized water. The solution was irradiated with a black light fluorescent lamp (F15T8/B1 General Electric Co.) producing radiant energy from 320 to 380 nm with a major intensity at 365 nm. The light intensity was 2.0×10^3 uw/cm^2. Figure 1 shows a schematic diagram of the photoreaction chamber. A volatile ^{14}C trap was employed. The equilibrium temperature of the chamber was 34°C. The initial and final pH of the solution were 5.9 and 4.7, respectively.

Samples were collected at intervals of 0, 1, 2, 4, 6, 24, 48, 72 and 96 hours for analysis. ^{14}C was determined by LSC techniques after separation of products on thin layer plates. Volatile acid ^{14}C was confirmed by conversion of $^{14}CO_2$ ~~to~~ to $BaCO_3$. A dark control was run with analysis of samples at intervals identical to photolysis study.

Table I presents naled photodegradation products. The half-life was determined to be 42 hours for photolysis (Figure 2) while the control (hydrolysis) produced a 78 hour halflife (Figure 3). The calculated naled photodegradation halflife is approximately 91 hours using the equation

$$\frac{1}{H_{t_{1/2}}} + \frac{1}{P_{t_{1/2}}} = \frac{1}{Obs_{t_{1/2}}}$$

The hydrolytic process is considered to be a dominant pathway in naled photolysis.

The proposed photodegradation pathways of naled in the presence of water and air are shown in Figure 4. The initial photodegradation product is DDVP while hydrolysis of naled to DDVP occurs before other oxidative products are formed. The hydrolysis products were BDCA and desmethyl naled while the photolysis products were DDVP, DCAA, and CO_2. DDVP and BDCA are major naled plant metabolites; DCAA is a major soil metabolite of naled.

4.0 CONCLUSIONS and RECOMMENDATIONS

According to the study, the half life of naled photolysis in water is 42 hours with the major product being BDCA which seems to be the result of hydrolysis rather than photolysis.

EFB cannot validate this study at this time because it is not known if sterile water and glassware were used to eliminate or greatly minimize possible microbial degradation.

If sterile conditions were used, this study will then be found to satisfy aqueous photolysis study requirements. If not, then the study will have to be repeated using sterile water and glassware.

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Table I

Naled Photodegradation Products at Different Intervals in the Presence of Water and Air

	Percent of Total ^{14}C						
Hour	Naled	DDVP	BDCA	DCAA	CO_2	Aqueous* (Unextracted)	Unknown**
0	99.6	0	0	0	0	0.4	0
1	90.7	2.9	4.6	0.4	0	0.9	0.5
2	88.2	5.0	2.8	0.6	0	2.8	0.6
4	87.3	4.0	4.8	1.3	0	1.5	1.1
6	82.6	2.2	10.0	2.8	0	1.7	0.7
24	63.4	10.9	13.7	4.1	0.4	4.7	2.8
48	43.7	7.6	29.4	6.2	2.4	7.5	3.2
72	33.0	8.0	36.2	6.9	5.1	8.2	2.6
96	26.8	5.0	44.4	6.1	11.1	4.4	2.2

* - Contained at least 4 different products with R_f = 0.41, 0.37, 0.29, and 0.25 in Solvent System B.

** - included at least two products.

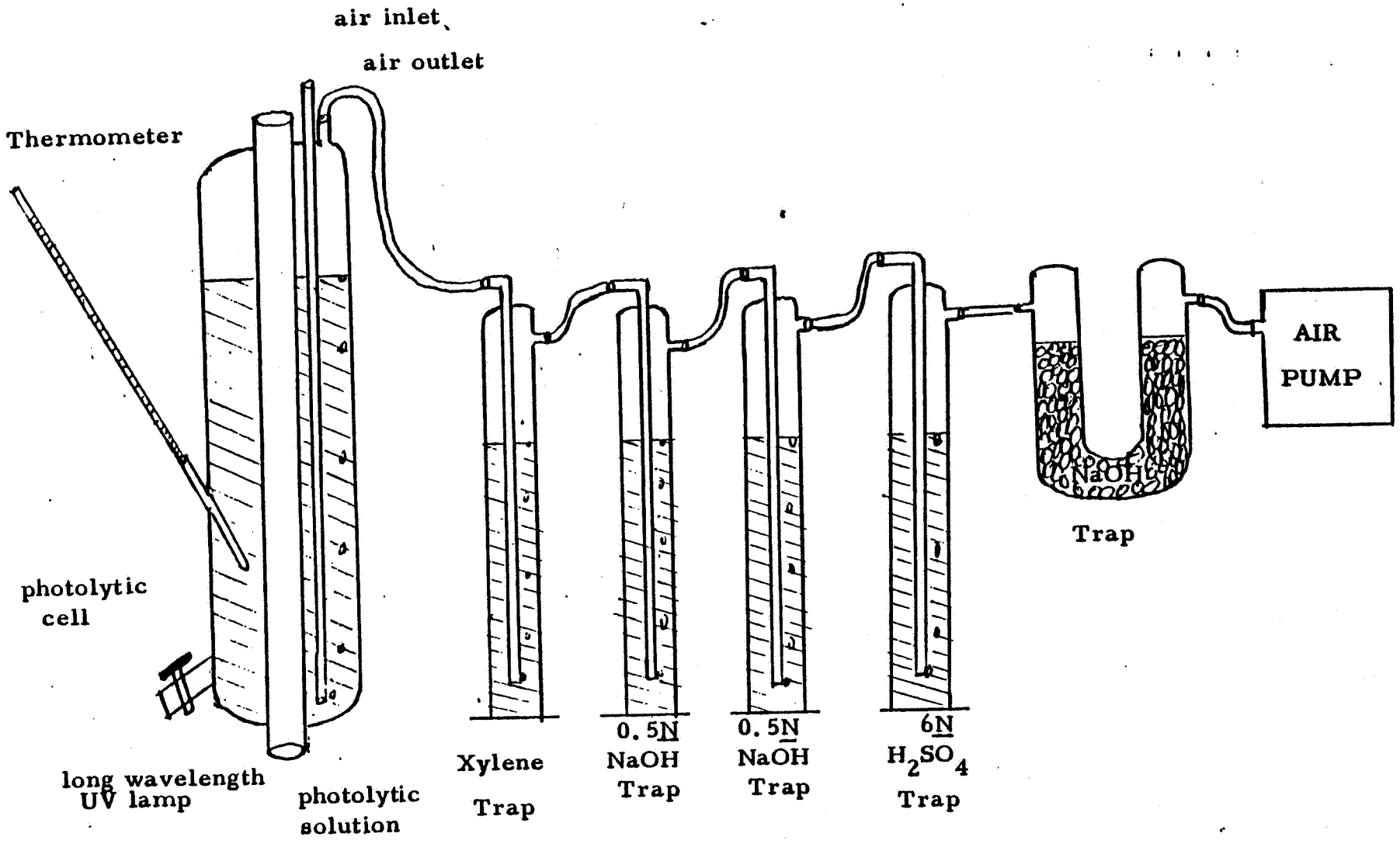
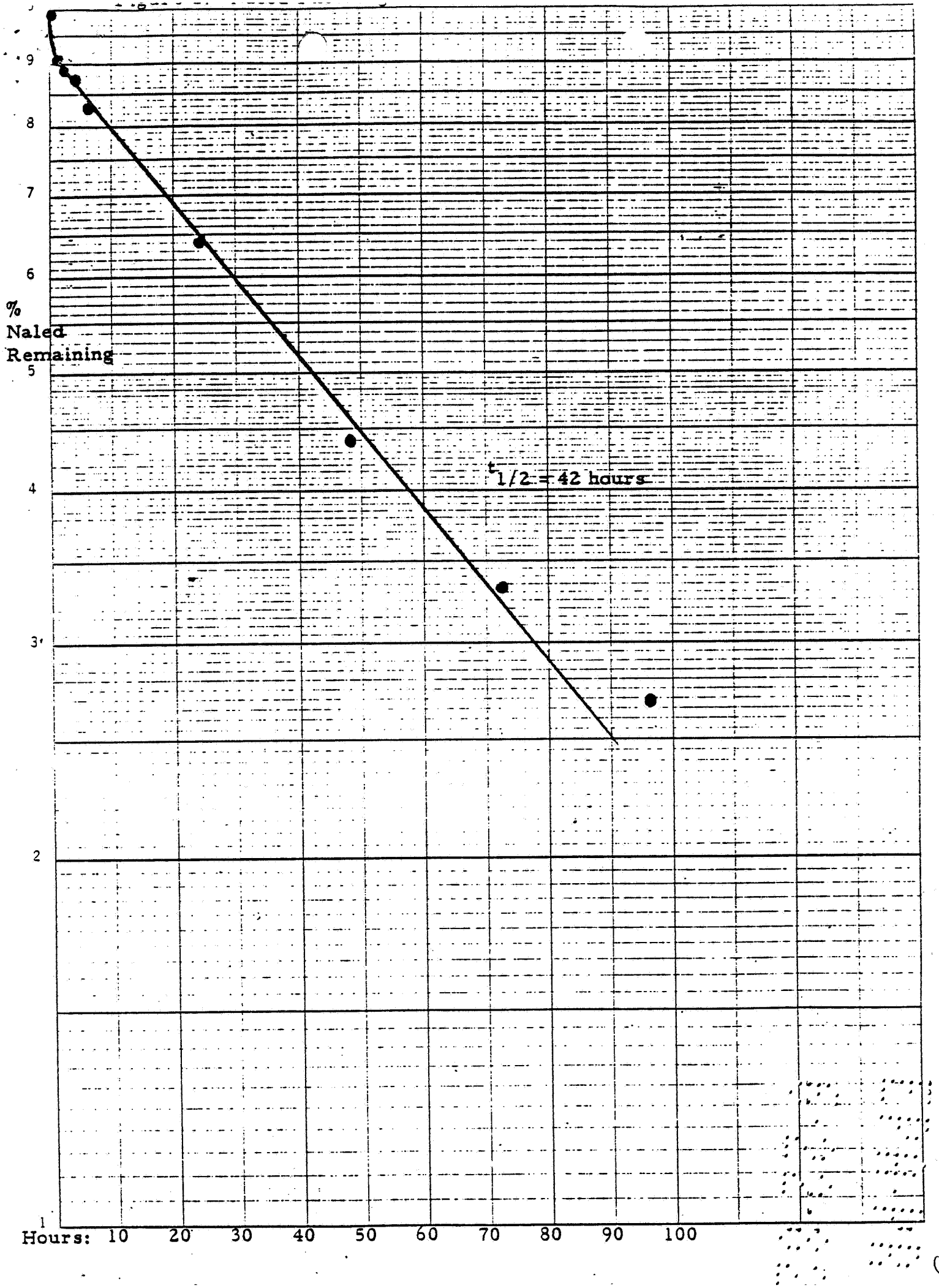
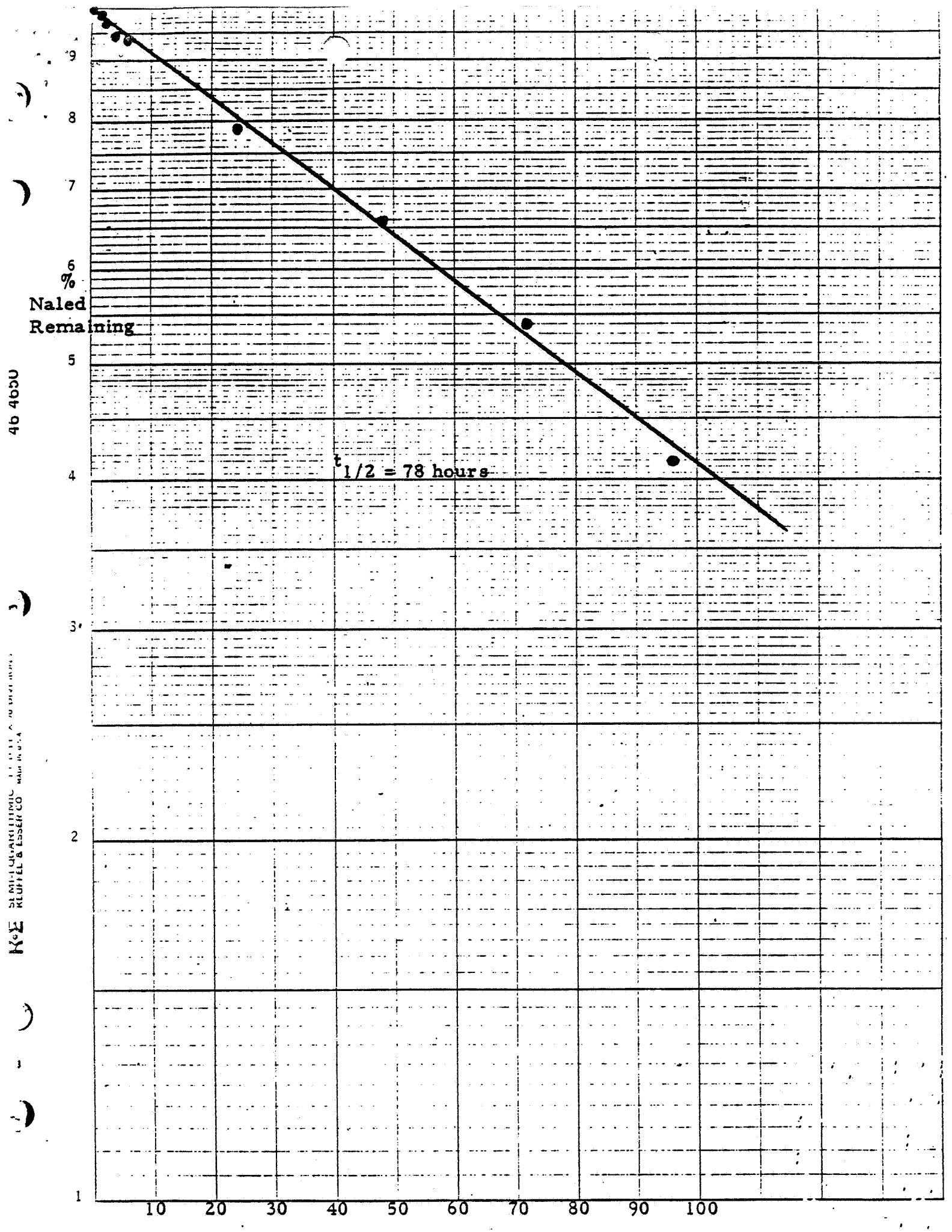


Figure 1. Diagram of Apparatus Used in Photodegradation Study


% Naled Remaining
9
8
7
6
5
4
3
2
1
$t_{1/2}$ = 42 hours
Hours: 10 20 30 40 50 60 70 80 90 100


9
8
7
6
%
Naled
Remaining
5
4
3
2
1
$t_{1/2}$ = 78 hours
10
20
30
40
50
60
70
80
90
100
46 4650
K+E SEMI-LOGARITHMIC
KEUFFEL & ESSER CO.

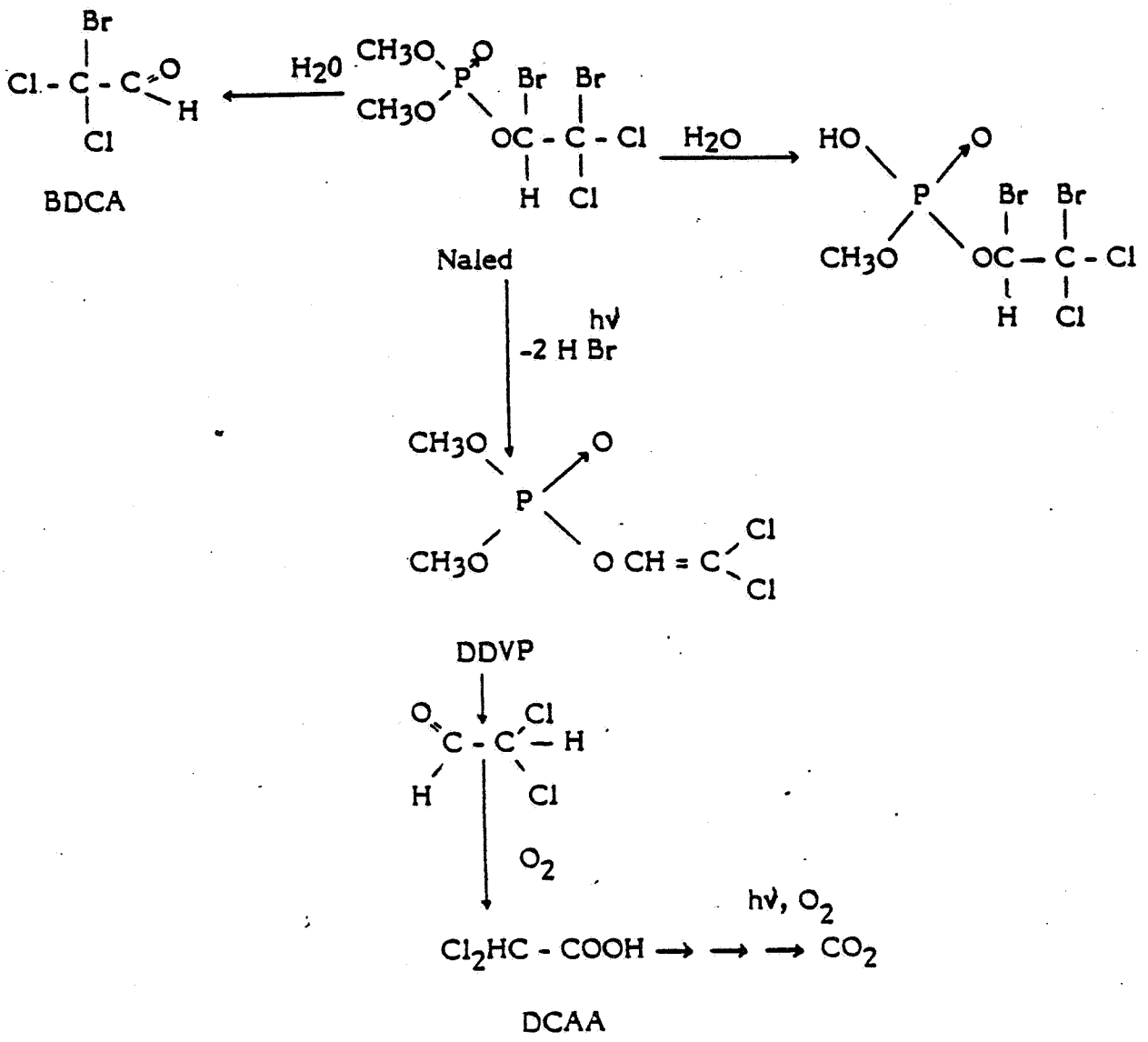



Figure 4. Proposed Naled Photodegradation in the Presence of Water and Air