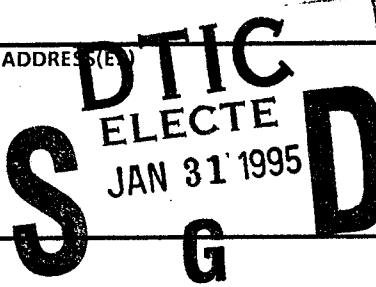


# REPORT DOCUMENTATION PAGE

Form Approved  
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE 08/04/78	3. REPORT TYPE AND DATES COVERED	
4. TITLE AND SUBTITLE STUDIES OF ENVIRONMENTAL FATES OF DIMP AND DCPD, MONTHLY PROGRESS REPORT 1			5. FUNDING NUMBERS	
6. AUTHOR(S) SPANGGORD, R.; CHOU, T.; MABEY, W.			DAMD 17 78 C 8053	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) SRI INTERNATIONAL MENLO PARK, CA			8. PERFORMING ORGANIZATION REPORT NUMBER  81340R06	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) ARMY MEDICAL RESEARCH AND DEVELOPMENT COMMAND FORT DETRICK, FREDERICK, MD			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
				
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION/AVAILABILITY STATEMENT  APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words)  THE OBJECTIVES OF THIS RESEARCH ARE TO CONDUCT LABORATORY EXPERIMENTS THAT WILL PREDICT THE PHOTOCHEMICAL AND BIOLOGICAL TRANSFORMATIONS OF DCPD AND DIMP IN THE SOILS AND WATERS OF ROCKY MOUNTAIN ARSENAL AND WILL PROVIDE A SEMIQUANTITATIVE EVALUATION OF DECOMPOSITION RATES OF AND PRODUCTS RESULTING FROM DCPD AND DIMP. DURING JULY, THIS PROJECT WAS INITIATED AND PRELIMINARY INVESTIGATIONS IN ANALYTICAL CHEMISTRY, MICROBIOLOGY, AND PHOTOCHEMISTRY WERE PERFORMED. ARRANGEMENTS HAVE BEEN MADE TO COLLECT FIELD SAMPLES AT ROCKY MOUNTAIN ARSENAL IN AUGUST. THIS WILL ENABLE US TO INITIATE THE STUDIES TO OBTAIN ACCLIMATED CULTURES FOR THE BIODEGRADATION PHASE OF THIS PROJECT. ANALYTICAL WORK ON DCPD WILL CONTINUE, AND THE PHOTOCHEMICAL STUDIES WILL BE INITIATED. EXHIBIT A IS A PRELIMINARY PERFORMANCE SCHEDULE FOR THIS PROJECT. EXHIBIT B DEPICTS THE EXPENDITURE OF FUNDS.  <b>DTIC QUALITY INSPECTED 3</b>				
14. SUBJECT TERMS CONTAMINANTS, FAUNA, FLORA, SOIL, GROUNDWATER, BIODEGRADATION, CHEMICALS			15. NUMBER OF PAGES	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT	

Rocky Mountain Arsenal  
Information Center  
Commerce City, Colorado

STUDIES OF ENVIRONMENTAL FATES OF DIMP AND DCPD

Monthly Progress Report 1

4 August 1978

By:

Ronald J. Spangord, Ph.D.  
Tsong-Wen Chou, Ph.D.  
William R. Mabey, Ph.D.

FILE COPY

Prepared for:

Commander  
U.S. Army Medical Research and Development Command  
ATTN: SGRD-UBG  
Fort Detrick  
Frederick, Maryland 21701

Contract No. DAMD 17-78-C-8053  
William Dennis, Project Officer

SRI Project LSU-7551

Approved by:

*Peter Lim*

Peter Lim, Director  
Pharmaceutical Analysis Department

*W. A. Skinner*

W. A. Skinner, Executive Director  
Life Sciences Division

Accession For	
NTIS CRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By _____	
Distribution / _____	
Availability Codes	
Dist	Avail and/or Special
A-1	

19950127 089

SRI International



## Introduction

The U.S. Army Medical Bioengineering Research and Development Laboratory has the responsibility of developing environmental standards for pollutants that contaminate the environment at Army installations. Two such pollutants at the Rocky Mountain Arsenal are dicyclopentadiene (DCPD) and diisopropylmethylphosphonate (DIMP).

The objectives of this research are to conduct laboratory experiments that will predict the photochemical and biological transformations of DCPD and DIMP in the soils and waters of Rocky Mountain Arsenal and will provide a semiquantitative evaluation of decomposition rates of and products resulting from DCPD and DIMP.

## Progress

During July, this project was initiated and preliminary investigations in analytical chemistry, microbiology, and photochemistry were performed.

### Analytical Chemistry

Arrangements were made with the project officer to have samples of DIMP, isopropylmethylphosphonate, and methylphosphonic acid shipped to SRI.

DCPD, obtained from Columbia Organic Chemicals (purity 99%), was found to be 96% pure by gas chromatographic analysis. Analysis of the impurities by gc/ms showed that they were mainly oxygenated derivatives of DCPD (see Figure 1 and attachments). These derivatives may be expected in photochemical or microbial transformation studies.

### Biodegradation

A preliminary test for toxic effects of DCPD was conducted with microorganisms collected from a eutrophic pond in Woodside, California, and from SRI soil. Mixed cultures of microorganisms were grown for 24 hr in shaker flasks containing basal salts medium with glucose and yeast extract at 25° C. These organisms were used to inoculate media containing 10 and 50 ppm DCPD. Microbial growth was measured by the turbidity of the broths. Table 1 presents the average turbidities of duplicate flasks after 16 and 40 hours of growth compared with control flasks. These data indicate that DCPD does not inhibit the growth of these organisms at up to 50-ppm concentration levels.

Table 1

## EFFECT OF DCPD ON CELL GROWTH

<u>Microorganism Source</u>	<u>DCPD Concentration (ppm)</u>	<u>Turbidity (% of Control)</u>	
		<u>at 16 hr</u>	<u>at 40 hr</u>
Eutrophic pond water	0 (control)	100	100
	2	99	100
	10	100	101
	50	99	102
SRI soil	0	100	100
	2	99	99
	10	100	99
	50	97	102

Photochemistry

A preliminary analysis of the uv spectrum of DCPD has shown that the extinction coefficients above 230 nm are less than  $83 \text{ molar}^{-1} \text{ cm}^{-1}$ . More spectra will be measured for accurate determination of the extinction coefficients (or lower limits), especially in the solar spectrum region above 290 nm.

Future Work

Arrangements have been made to collect field samples at Rocky Mountain Arsenal in August. This will enable us to initiate the studies to obtain acclimated cultures for the biodegradation phase of this project.

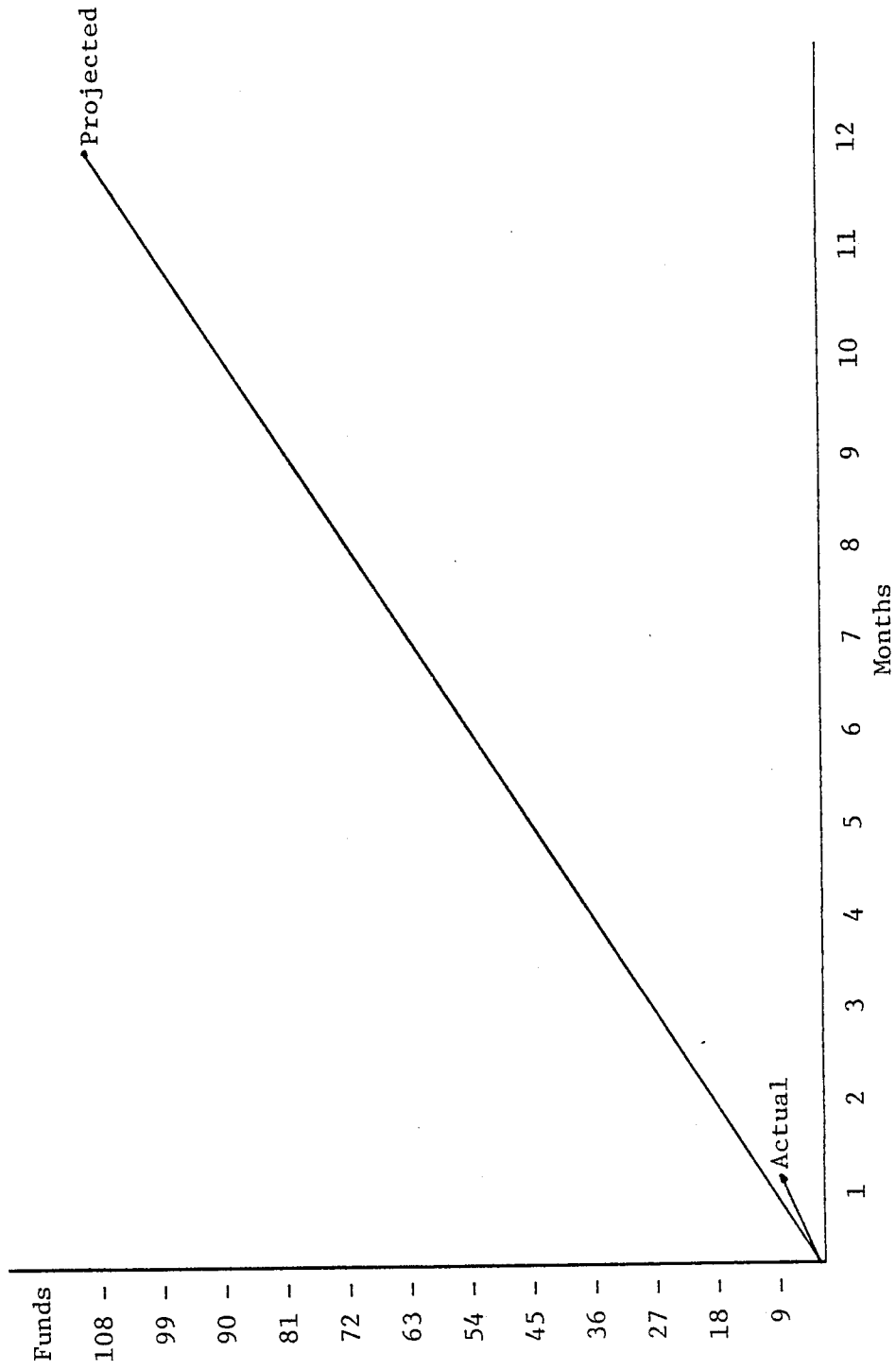
Analytical work on DCPD will continue, and the photochemical studies will be initiated.

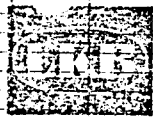
Exhibit A is a preliminary performance schedule for this project. Exhibit B depicts the expenditure of funds.

EXHIBIT A PERFORMANCE SCHEDULE FOR PROJECT TASKS

TASK DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	12
	Months											
Sample collection												
Photochemical studies of DIMP												
Photochemical studies of DCPD												
Culture acclimation												
Biodegradation of DIMP												
Mineralization, DIMP water												
Mineralization, DIMP soil												
Soil activation, DIMP												
Biodegradation, DCPD												
Mineralization, DCPD water												
Mineralization, DCPD soil												
Soil activation, DCPD												
Product identifications												
Monthly reports	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Final report												▲
	4	8	12	16	20	24	28	32	36	40	44	48
	Weeks											

EXHIBIT B EXPENDITURES





# GAS CHROMATOGRAM

No. \_\_\_\_\_ Date \_\_\_\_\_ Sign. \_\_\_\_\_  
Vol. Inj. \_\_\_\_\_ Conc. \_\_\_\_\_ Solvent \_\_\_\_\_  
Sample \_\_\_\_\_  
Temp. Ft. Heater °C \_\_\_\_\_ Mol. Srp. °C \_\_\_\_\_  
Col. Inj. Program. °C \_\_\_\_\_ Hel. Flow ml/min \_\_\_\_\_  
Recorder Speed \_\_\_\_\_ Gain \_\_\_\_\_  
Note \_\_\_\_\_

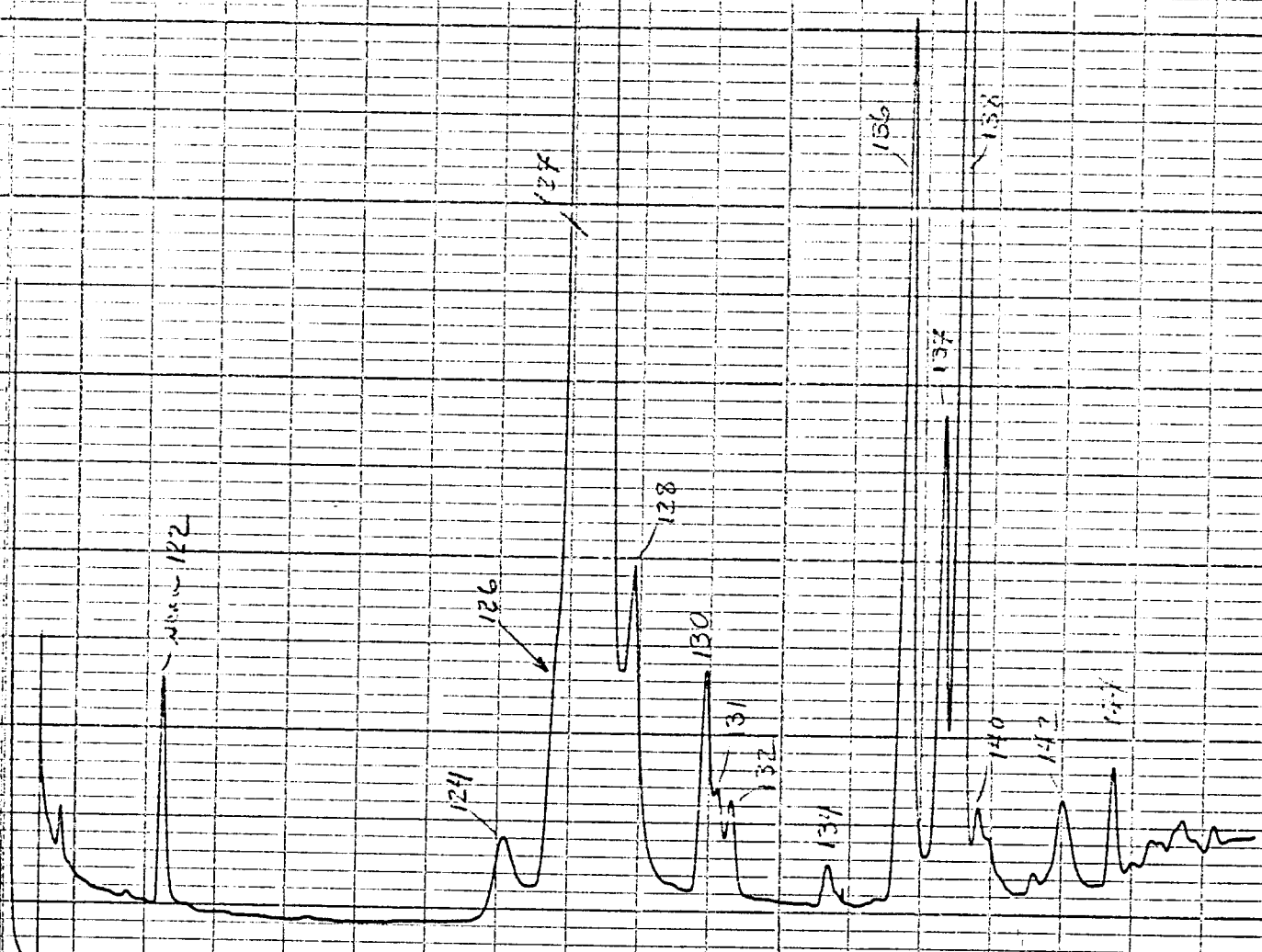
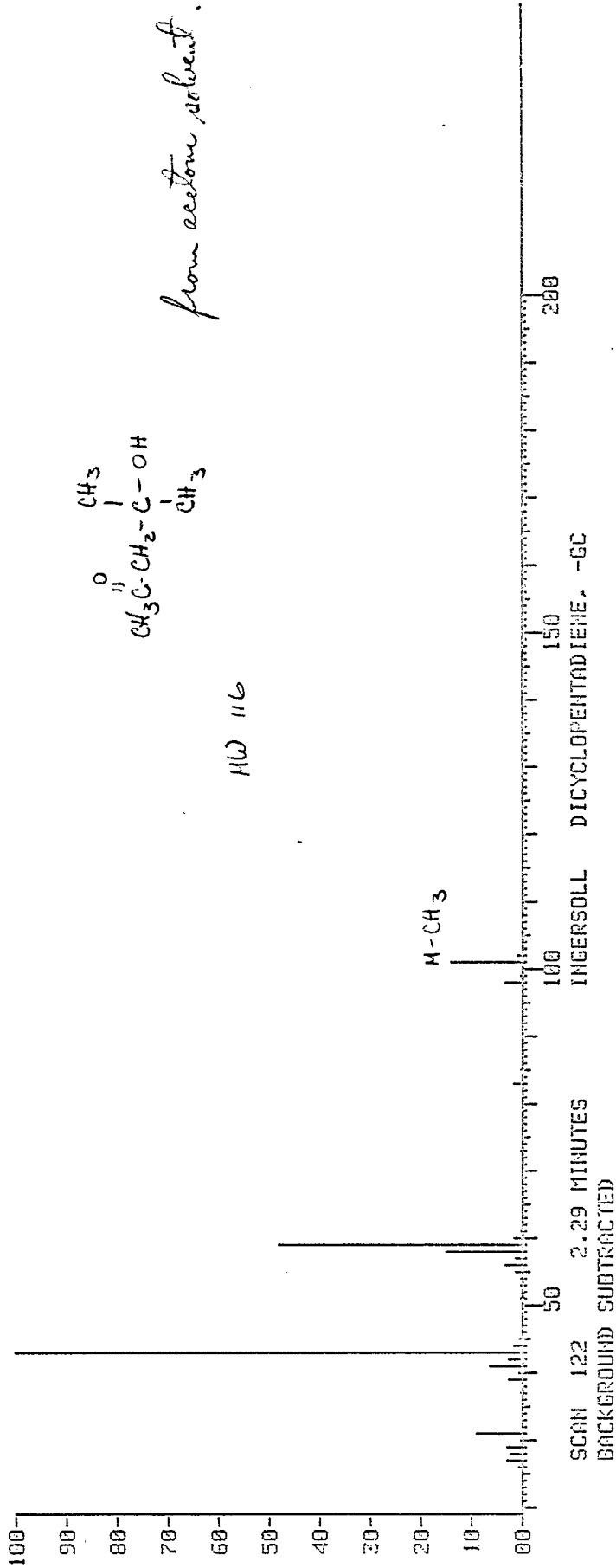
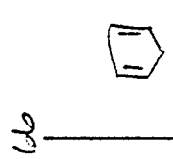


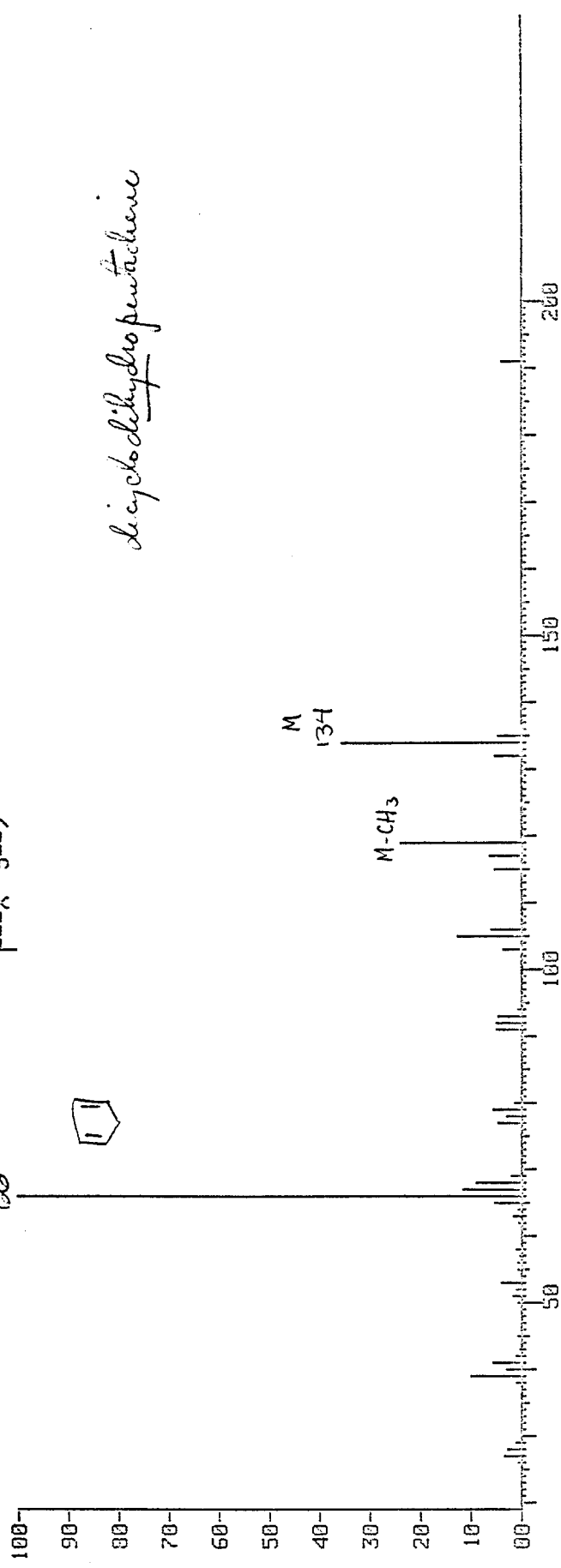
Figure 1 GC/MS Chromatogram of DCPD



---X 5-->

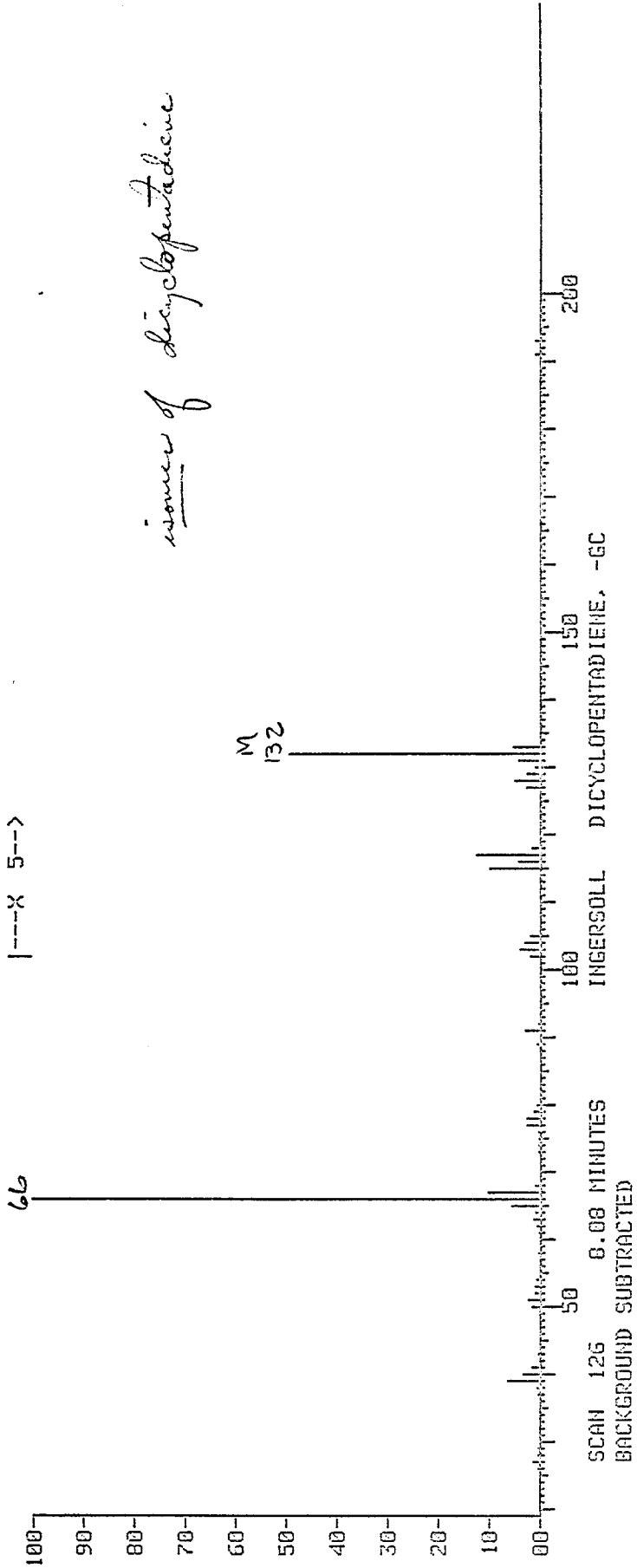


*dicyclopentadiene*

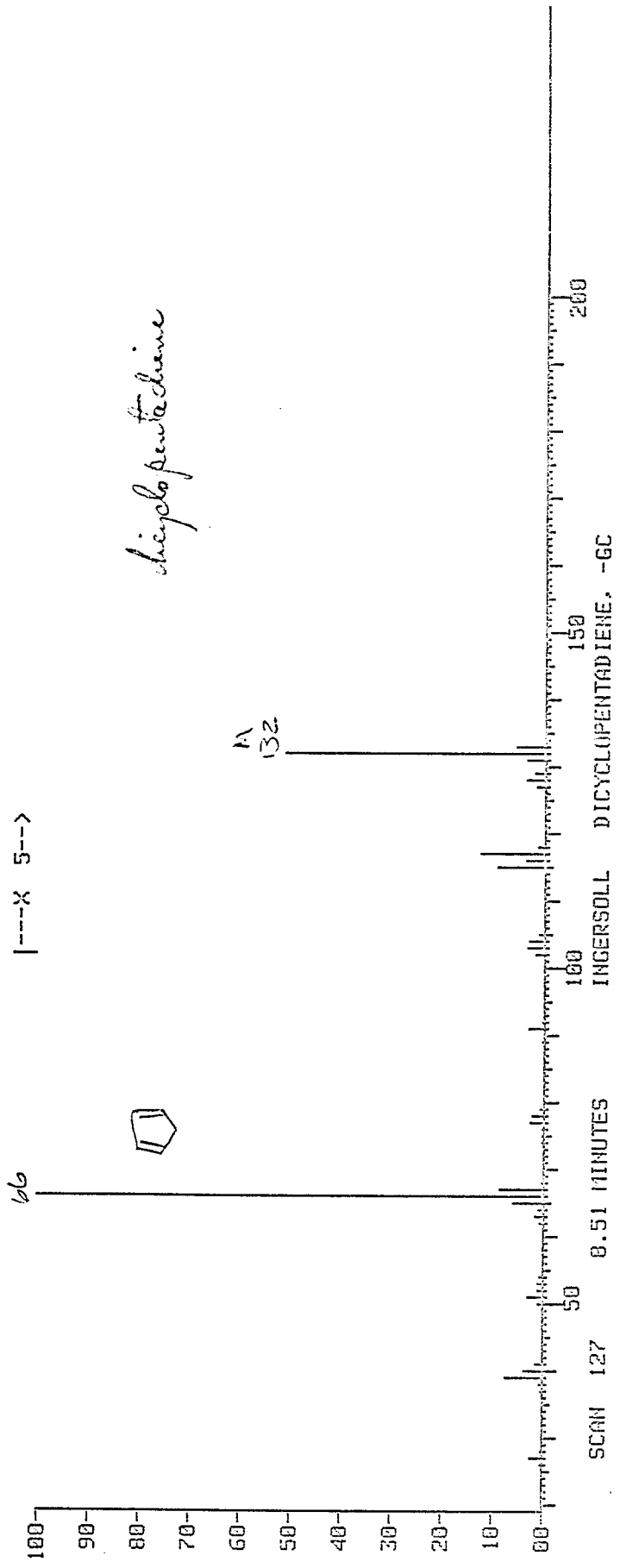


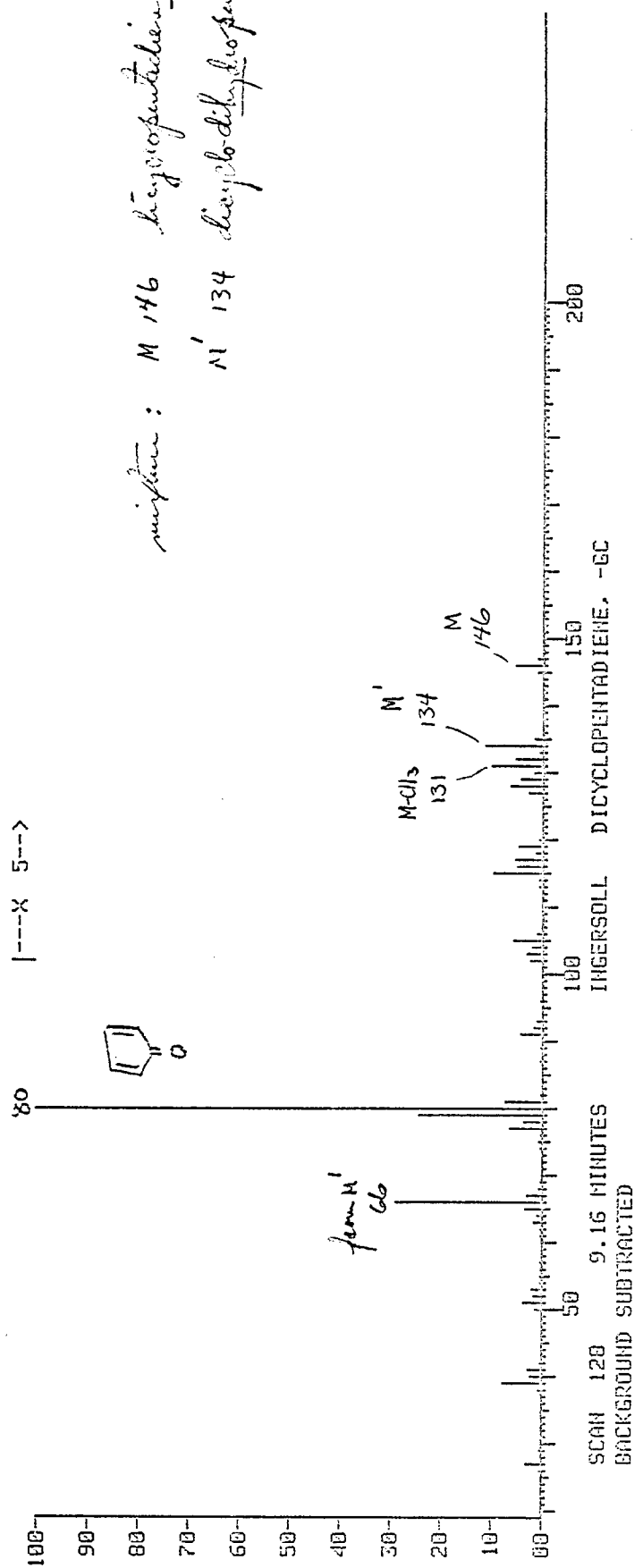
SCAN 124 7.43 MINUTES  
BACKGROUND SUBTRACTED

INGERSOLL DICYCLOPENTADIENE, -GC

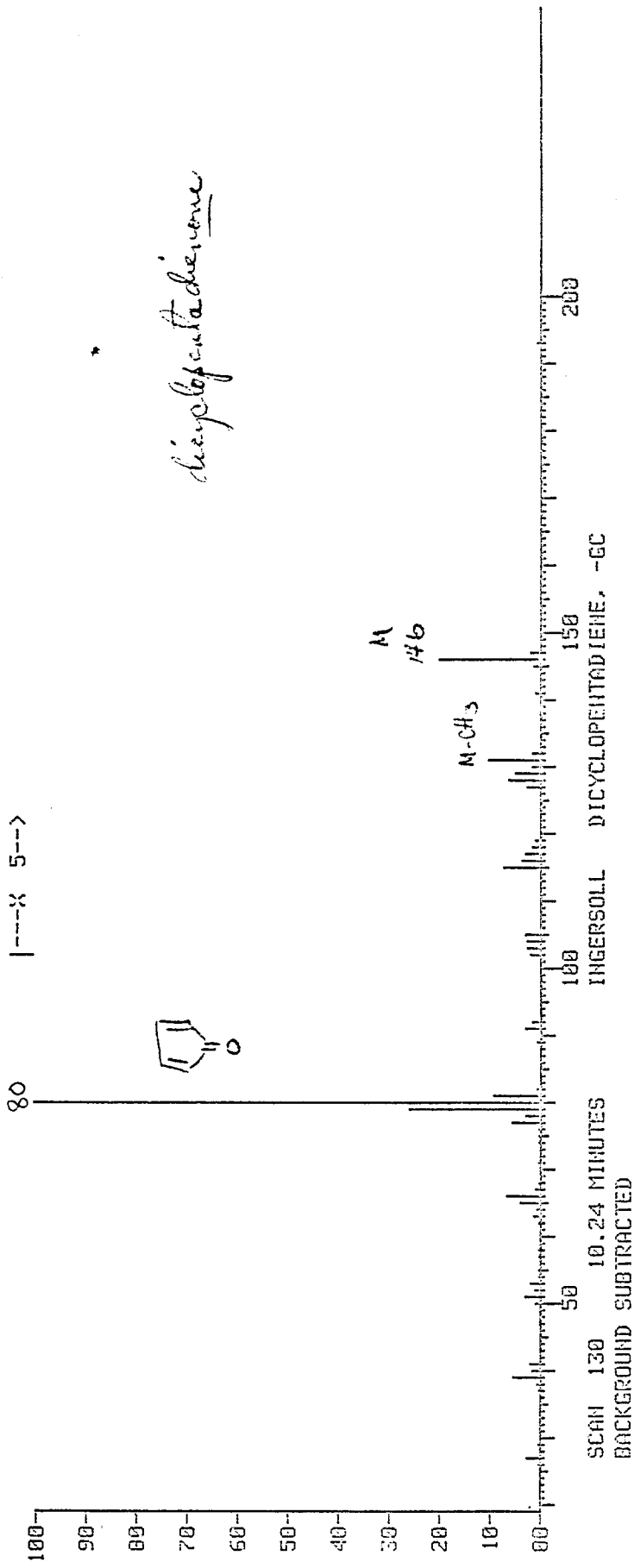


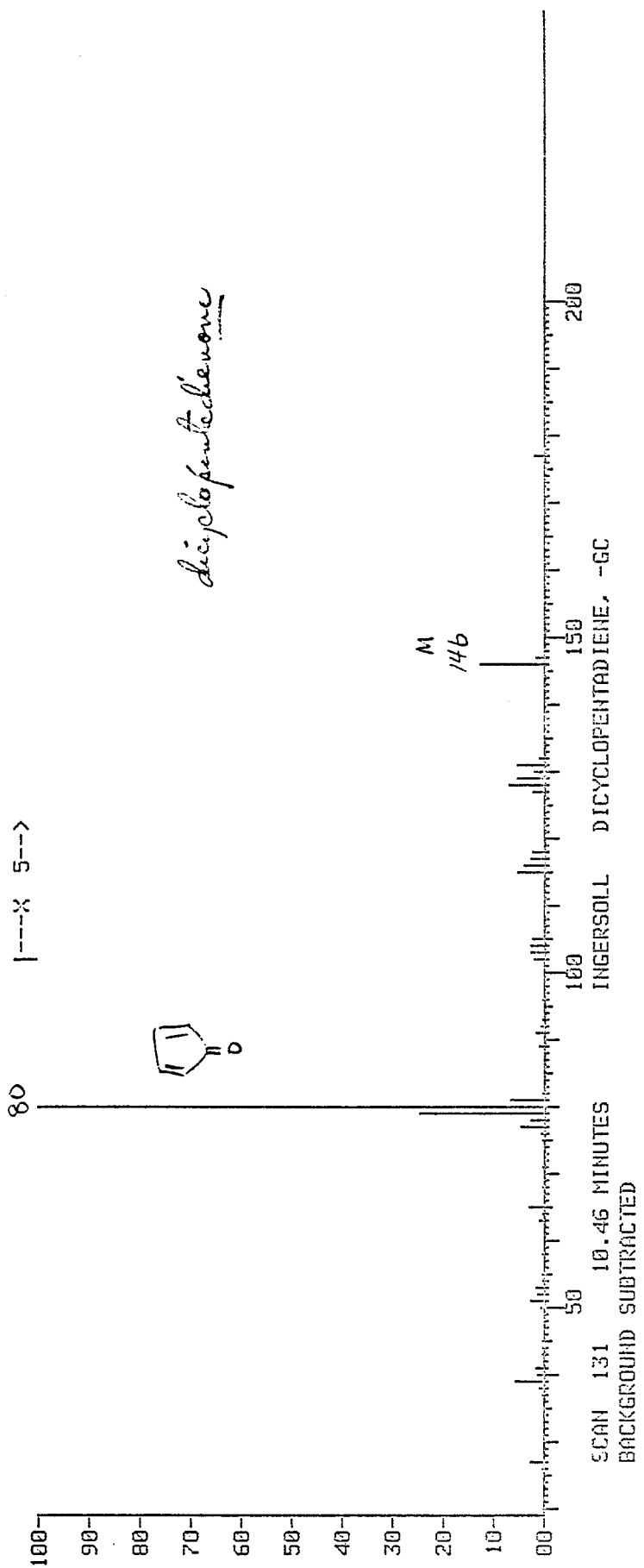
*isomer of dicyclopentadiene*

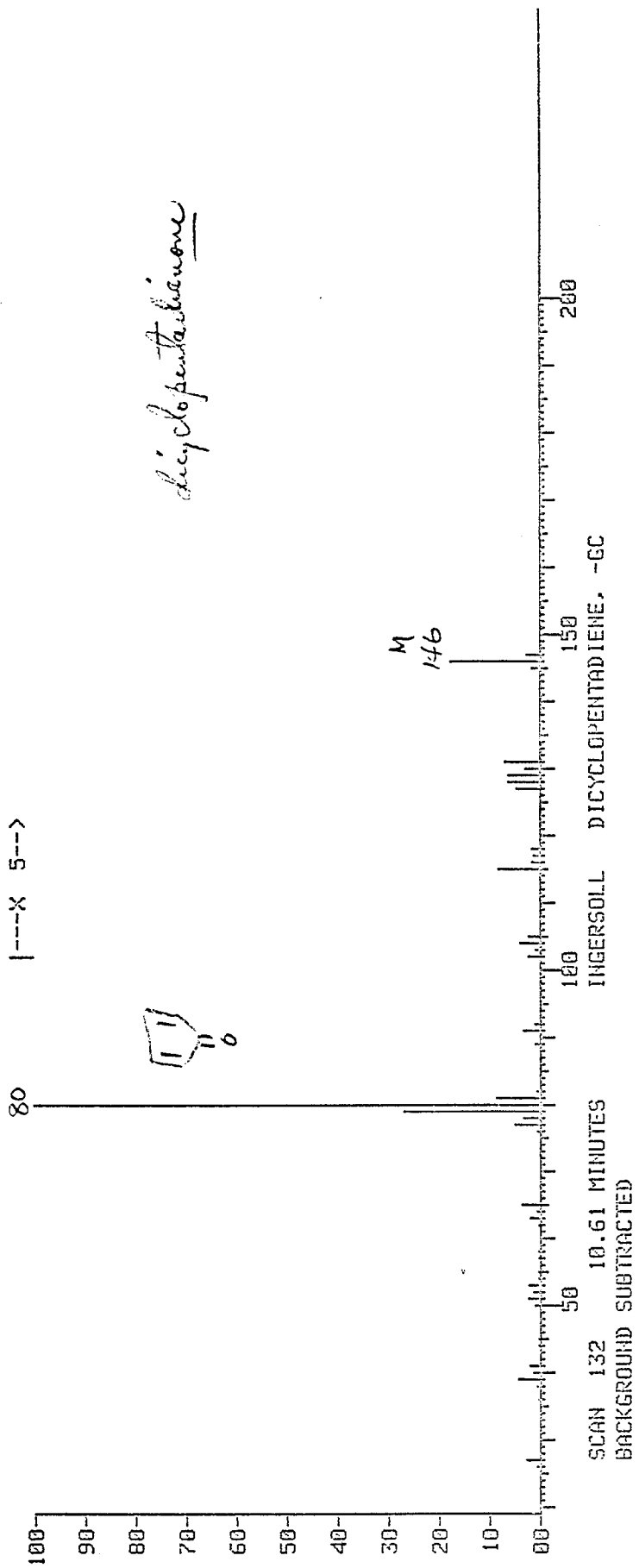


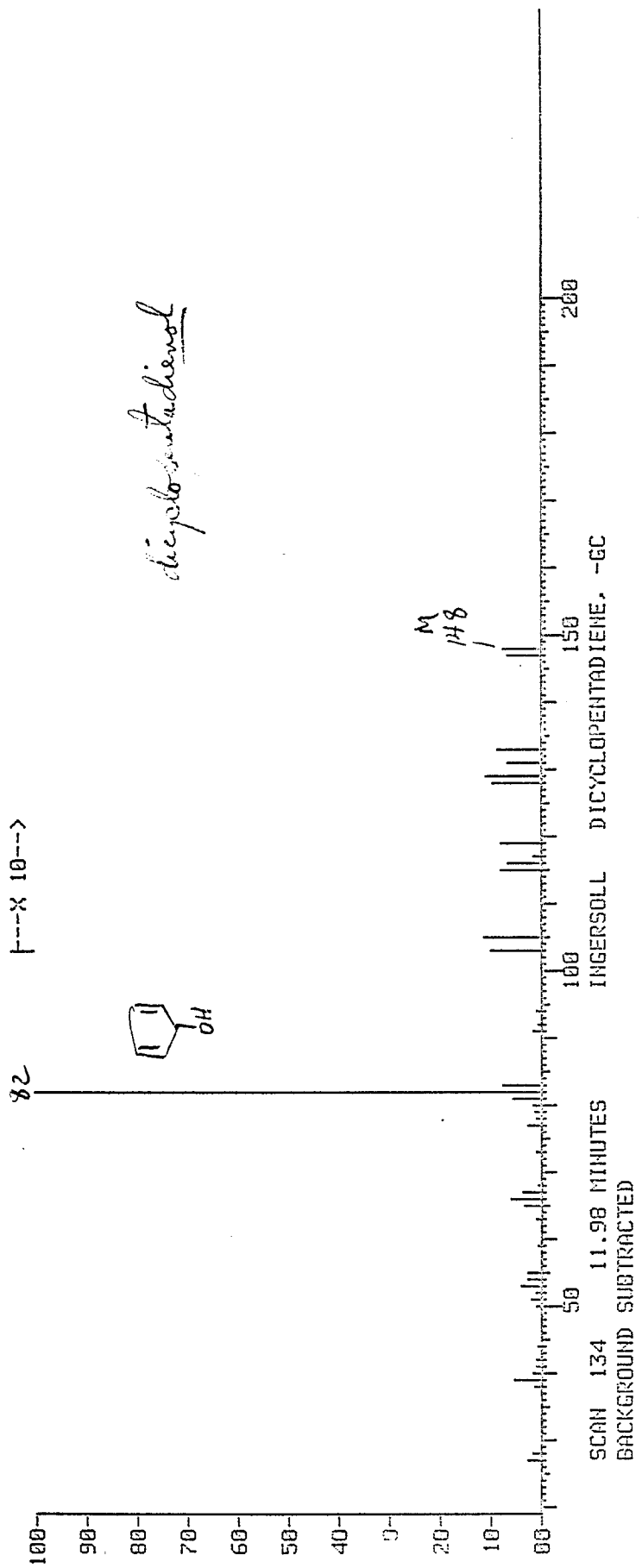


mixture: M 146 hexapentadiene (major)  
 N' 134 dicyclopentadiene (minor)

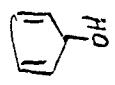


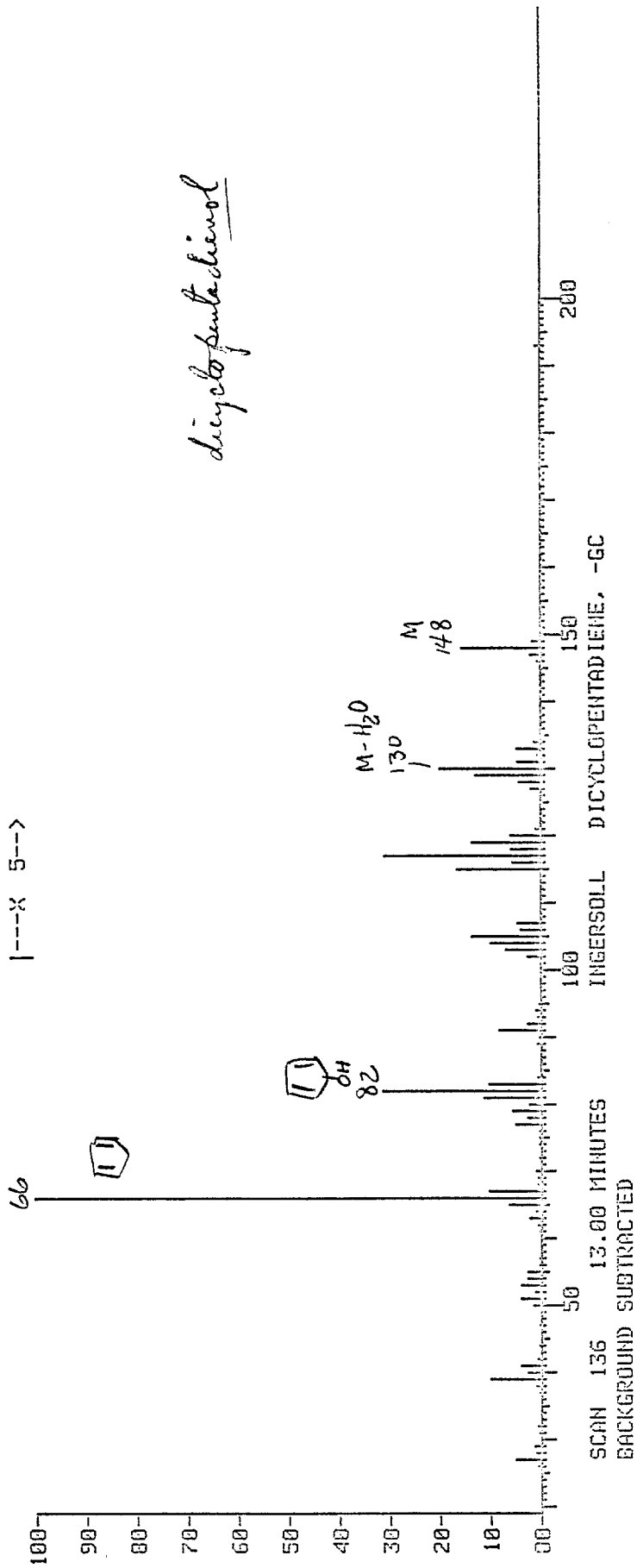


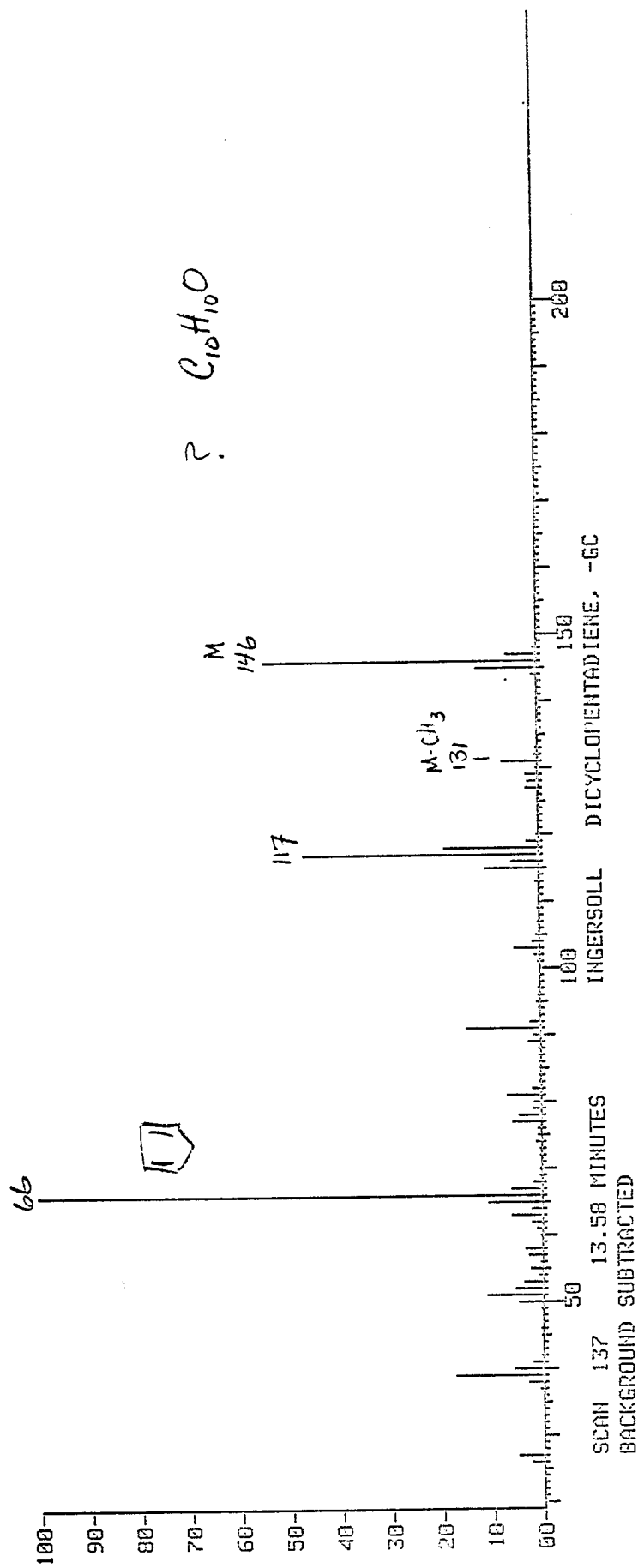


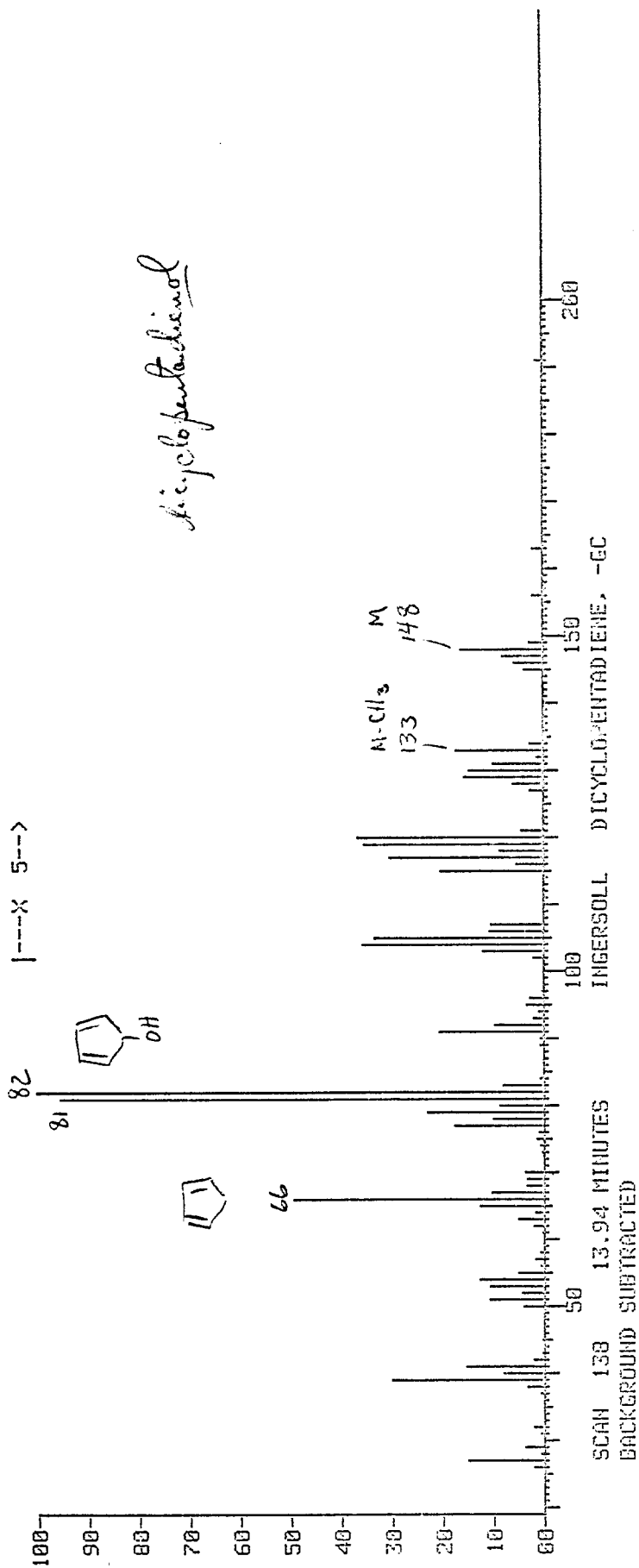


*dicyclopentadiene*





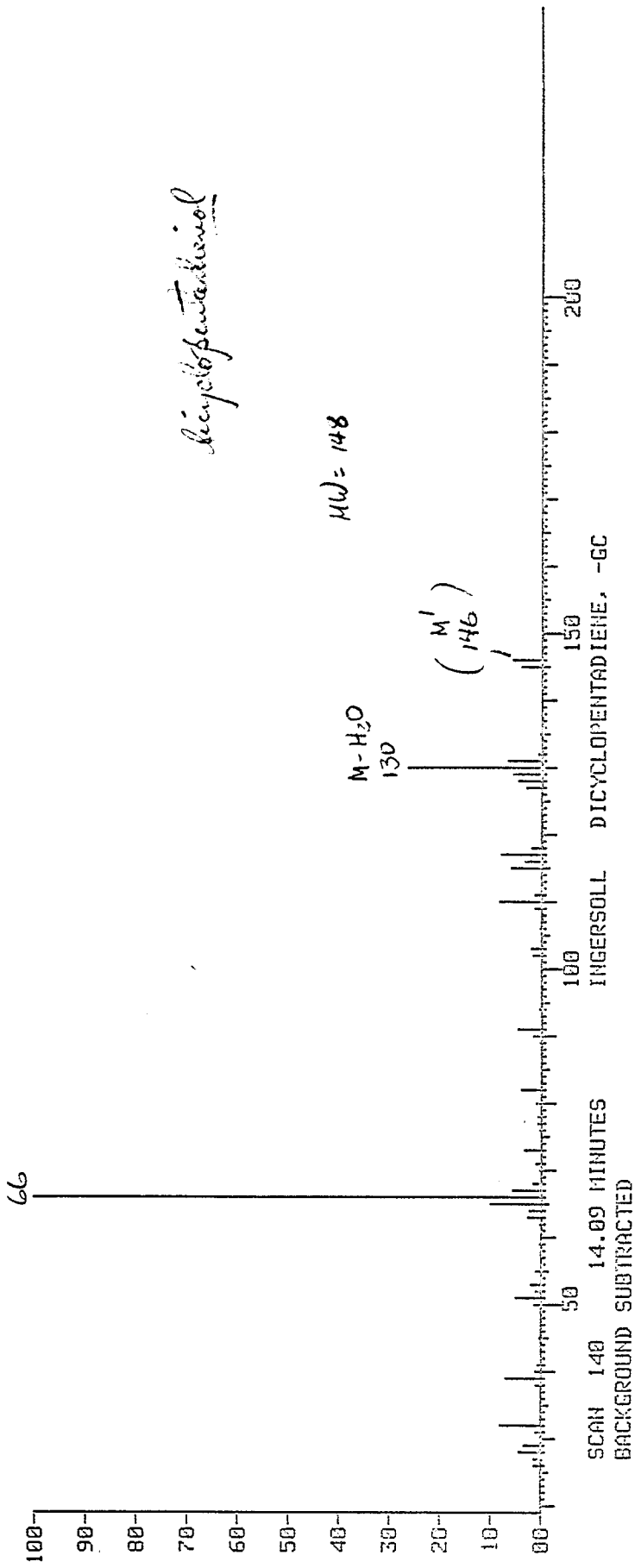




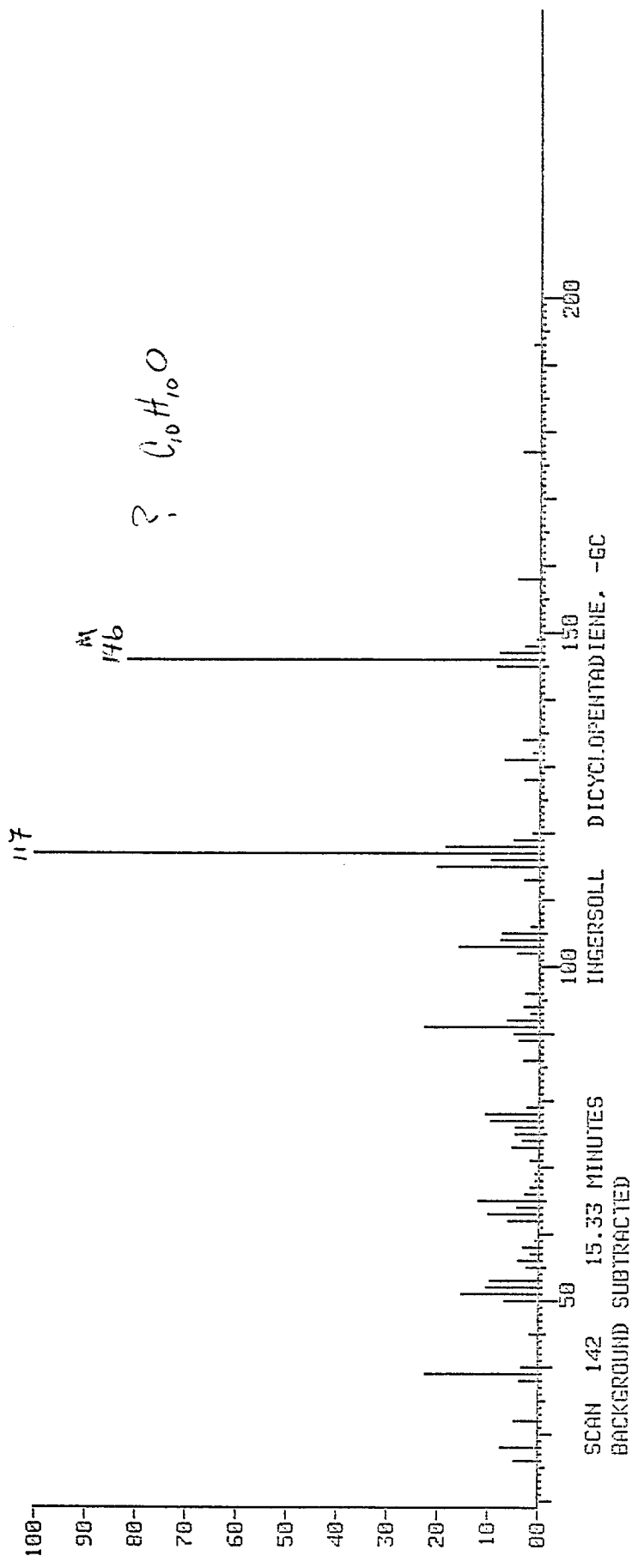
*dicyclopentadienol*

*dicyclopentadiene*

MW = 148



SCAN 140 14.09 MINUTES  
BACKGROUND SUBTRACTED  
INGERSOLL DICYCLOPENTADIENE, -GC



*dicyclopentadiene-diol*

