CHEMICAL PRODUCTS CORPORATION
CARTERSVILLE, GEORGIA 30120
POST OFFICE BOX 2470
TELEPHONE 770-382-2144
FAX 770-386-6053

May 31, 2006

Associate Director for Communications
Office of the Director
National Institutes of Health
Building 1, Room 344
9000 Rockville Pike
Bethesda, MD 20892

Subject: **Request For Correction** of National Toxicology Program Technical Report 494, NIH Publication Number 05-3953 – Request that TR494 be withdrawn because of factual errors

Dear Madam or Sir;

This letter is a Request For Correction submitted under the auspices of NIH's Information Quality Guidelines by Chemical Products Corporation (CPC), a Georgia corporation located in Cartersville, Georgia. CPC requests that National Toxicology Program Technical Report 494, NIH Publication No. 05-3953, be withdrawn because the conclusions presented in this technical report were accepted by NTP's Board of Scientific Counselors' Technical Reports Review Subcommittee on December 9, 2004 based upon undocumented genetic toxicology data presented for the first time on December 9, 2004, and subsequently incorporated into TR494.

Mutagenicity assay data, first introduced by NTP in the third peer review of TR494 on December 9, 2004, purports to demonstrate that the TR494 test article is not contaminated by mutagenic impurities, even though NTP had previously received positive mutagenicity assay results on 2 independently tested aliquots of the TR494 test article. The TR494 test compound, Anthraquinone, CAS # 84-65-1, is not a mutagen, so a positive mutagenicity assay on the TR494 test article confounds the conclusions presented in TR494. NTP has been unable to

provide documentation that Sample A07496 in Appendix E, Table E3 of TR494 is an aliquot of the TR494 test article as stated in TR494; thus the conclusions accepted by the peer review panel based upon this new mutagenicity data are untenable. Records that do exist demonstrate that NTP's contractor responsible of archiving the TR494 test article, Battelle, has sent a single sample of Anthraquinone to BioReliance Toxicology Test Article Repository over the past several years. This was an Anthraquinone sample procured from Cerilliant on January 10, 2001, long after the completion of the TR494 study.

The initial draft of TR494 was reviewed and accepted by NTP's Board of Scientific Counselors' Technical Reports Review Subcommittee on May 21, 1999. This draft was later withdrawn as the result of an Information Quality Act Request for Correction submitted by CPC. In that Request for Correction, CPC demonstrated that the test compound Anthraquinone, CAS # 84-65-1, is not mutagenic and that the TR494 test article, submitted by CPC to BioReliance Corporation for preincubation mutagenicity assay, was found to be mutagenic as follows:

Salmonella Mutagenicity Assay
Summary of Results

Average Revertants Per Plate ± Standard Deviation

Liver Microsomes: None

Dose (µg)	TA98	TA100[a]
0.0	19 ± 6	187 ± 5
10	16 ± 3	181 ± 23
25	20 ± 0	201 ± 37
50	31 ± 1	197 ± 9
100	27 ± 1	193 ± 29
250	61 ± 3	193 ± 25
500	108 ± 6	224 ± 26
1000	127 ± 4	267 ± 18
2500	225 ± 1	409 ± 11
Pos	626 ± 37	621 ± 5

Liver Microsomes: Rat liver S9

Dose (µg)	TA98	TA100
0.0	18 ± 7	143 ± 5
10	13 ± 5	148 ± 2
25	19 ± 2	139 ± 19
50	29 ± 3	139 ± 3
100	20 ± 2	118 ± 16
250	25 ± 8	115 ± 21
500	44 ± 1	115 ± 10
1000	52 ± 8	123 ± 8
2500	115 ± 21	144 ± 22
Pos	840 ± 95	455 ± 28

0.0 = Vehicle plating aliquot of 50 µL

Pos = Positive Control concentrations as specified in Materials and Methods section.
a = Data from Experiment B2

NTP had not conducted a mutagenicity assay on the TR494 test article prior to CPC's data submission in 2000.

Prior to a second peer review of a substantially revised draft TR494 on February 18, 2004, NTP had been informed that a second independently-obtained aliquot of the TR494 test article had been assayed and had been found to be mutagenic, even though other samples of the test compound, Anthraquinone, were determined not to be mutagenic. In addition to CPC's positive mutagenicity assay detailed above, a positive mutagenicity assay had been reported by Butterworth et al. (Butterworth, B.E., Mathre, O.B., and Ballinger, K. (2001); "The preparation of anthraquinone used in the National Toxicology Program cancer bioassay was contaminated with the mutagen 9-nitroanthracene"; *Mutagenesis* 16, 169-177). The Butterworth et al. findings are consistent with CPC's findings.

On February 18, 2004, concern over the confounding effects of contamination of the TR494 test article with at least one direct-acting mutagen prompted NTP's Board of Scientific Counselors' Technical Reports Review

Subcommittee to restrict the scope of the conclusions in TR494 by adding language stating that these conclusions applied only to "Anthracene-derived Anthraquinone". Contamination of the TR494 test article with mutagens was believed to be the result of its method of manufacture - oxidation of Anthracene. An explanation of the two more common alternative manufacturing processes, the Friedel-Crafts process and the Diels-Alder process was also presented in TR494. Anthracene-derived Anthraquinone is only rarely encountered in commerce in the United States.

In the third peer review of a draft TR494 conducted on December 9, 2004, new data was presented by Dr. Richard Irwin, NTP principal investigator, to (1) demonstrate that, contrary to the previous reports, the TR494 test article was not mutagenic in Salmonella typhimurium strainsTA98, TA100, and TA1537, and (2) justify significant changes to the TR494 accepted by the February 18, 2004 peer review panel essentially removing all restrictions on the scope of the conclusions. The data presented to the December 9, 2004 peer review panel, and incorporated into TR494 in Table E3 in Appendix E, was generated by BioReliance Corporation on a sample designated as Sample A07496; this sample was represented as being an aliquot of the TR494 test article.
The third and final TR494 was accepted by NTP's Technical Reports Review Subcommittee on December 9, 2004 based upon the understanding that the TR494 test article was not mutagenic to Salmonella typhimurium strains TA98, TA100, or TA1537 without or with S9 metabolic activation.

A Freedom of Information Act request for records to substantiate that the TR494 test article had been submitted by NTP for mutagenicity assay, and that it had been found to be non-mutagenic, revealed that there is no record of the test article having been submitted by NTP's contractor, Battelle, for genetic toxicology testing to BioReliance Corporation.

Records furnished by NIEHS responding to CPC's Freedom of Information Act request show that NTP's contractor responsible of storage of the TR494 test article, Battelle, has sent only one Anthraquinone sample to BioReliance Toxicology Test Article Repository – a sample obtained from Cerilliant in 2001, many years after completion of the TR494 study. The origin of Sample A07496 cannot be verified through National Toxicology Program documents and records, thus the conclusions presented in TR494 were accepted by NTP's peer review panel based upon untenable assertions concerning the non-mutagenicity of the TR494 test article.

The final TR494, issued in September, 2005, was substantially altered from the document accepted by the NTP's Board of Scientific Counselors' Technical Reports Review Subcommittee on February 18, 2004. Acceptance of the altered TR494 on December 9, 2004 was based upon new genetic toxicology test data offered by NTP to demonstrate that the TR494 test article was not mutagenic to specific strains of Solmonella typhimurium bacteria. Page 9 of TR494 states, "Sample A07496, the compound used in the 2-year studies (99.8% pure), was negative in TA98, TA100, and TA1537, with and without rat S9." Data for this sample demonstrating negative mutagenicity assay outcomes are contained in Appendix E, Table E3.

CPC submitted a Freedom of Information Act request to NIEHS on March 28, 2006; a copy of that request letter is enclosed. CPC received a confirmation letter from Joyce C. Bumann dated April 12, 2006; a copy of that letter is enclosed. A final response was received from Kim L. Minneman, NIEHS's new Freedom of Information Coordinator, dated May 19, 2006; a copy of this final response, and the 43 pages of documentation enclosed with it, are also enclosed with this Request for Correction. NIEHS documents demonstrate that only one sample of Anthraquinone – obtained many years after the TR494 test article - has been submitted to BioReliance Toxicology Test Article Repository.

In the absence of records substantiating that mutagenicity assay of the TR494 test article in Salmonella typhimurium strains TA98, TA100, and TA1537 was conducted by NTP during the period in 2004 after the February 18 peer review and before the December 9 peer review, CPC submits that TR494 does not meet the requirements of NIH's Guidelines for Ensuring the Quality of Information Disseminated to the Public. We request that TR494 be immediately withdrawn by NTP until such time as NTP can demonstrate beyond a reasonable doubt that the TR494 test material has exhibited no mutagenicity to Salmonella typhimurium strains TA98, TA100, and TA1537 without and with S9 metabolic activation in preincubation mutagenicity assay, as stated in TR494.

Chemical Products Corporation further requests that an investigation be undertaken by NIEHS to determine the source of the data provided on December, 2004 and incorporated into the final TR494 in Appendix E.

In summary, NIEHS's response to a Freedom of Information Act request submitted by CPC has revealed that mutagenicity assay data purporting to demonstrate the absence of mutagenicity in the TR494 test article cannot be associated with an aliquot of the TR494 test article submitted by NTP's contractor, Battelle, to BioReliance Toxicology Test Article Repository. NIEHS has been unable to provide documentation to demonstrate that an aliquot of the TR494 test article was actually submitted for mutagenicity assay during 2004. CPC requests that TR494 be withdrawn until NTP can demonstrate beyond a reasonable doubt that the TR494 test article is not mutagenic to Salmonella typhimurium strains TA98, TA100, and TA1537 without or with S9 metabolic activation, as is asserted in TR494.

The following information about this Request For Correction is provided in the specific format outlined in the "Responsibility of the Complainant" section of

the HHS Guidelines for Ensuring the Quality of Information Disseminated to the Public.

- A detailed description of the specific material that is proposed for correction, including where the material is located, i.e., the publication title, date, and publication number, if any, or the web site and web page address (URL), or the presentation, presenter, date and mode of delivery: The material proposed for correction is National Toxicology Program Technical Report 494, Toxicology and Carcinogenesis Studies of Anthraquinone (CAS No. 84-65-1) in F344/N Rats and B6C3F1 Mice (Feed Studies), NIH Publication Number 05-3953, found on NTP's web site at http://ntp.niehs.nih.gov/files/494_Web.pdf and http://ntp.niehs.nih.gov/index.cfm?objectid=070AFB30-E3C1-3AF8-65739A2BF09C05A7 and possibly elsewhere.
- the specific reasons for believing that the information does not comply with OMB, HHS, or NIH guidelines and is in error, and supporting documentation, if any: the attached Freedom of Information Act request for information submitted by CPC and the response from NIEHS demonstrate that no record exists of submission of the TR494 test article for mutagenicity assay. The mutagenicity assay data for Sample A07496 presented in TR494 cannot demonstrate that the TR494 test article is not mutagenic because there are no records demonstrating that Sample A07496 is an aliquot of the TR494 test article submitted for mutagenicity assay in 2004. The true identity of Sample A07496 remains unknown.

The TR-494 test article was found by CPC to be mutagenic in Salmonella typhimurium strains TA98 and TA100 without S9 activation and mutagenic in strain TA98 in the presence of S9 activation when preincubation mutagenicity assays were conducted in early 2000. NTP was informed of the positive results of the mutagenicity assay and was provided a full copy of the BioReliance test report by CPC. Subsequently, Butterworth et al. (2001) independently obtained

an aliquot of the TR494 test article and also obtained positive mutagenicity assay results for the TR494 test article consistent with CPC's findings.

There is no documentary evidence that NTP has conducted a mutagenicity assay of the TR494 test article even though data on Sample A07496 purporting to demonstrate that the TR494 test article is not mutagenic are included in TR494.

- Suggested recommendations for what corrective action(s) should be taken: CPC requests that TR-494, NIH Publication Number 05-3953 be immediately withdrawn from the NTP web site and not disseminated to the public in any form until such time as the non-mutagenicity of the TR494 test article can be clearly established.
- A description of how the person requesting the correction is affected by the information error: Incorrect information attributing evidence of carcinogenicity to Anthraquinone adversely effects the ability of CPC and its subsidiary, Chemical Products Technologies, LLC, to sell their Anthraquinone suspension products to the North American paper industry. The North American paper industry will fully realize the increased pulp recovery benefits of Anthraquinone use when incorrect information in TR494 generating uncertainty about its safety and environmental impact is withdrawn and corrected.
- Complete contact information for the requester, including name, mailing address, telephone number, e-mail address, and organizational affiliation, if any: This letter is submitted by Jerry A. Cook, Technical Director, Chemical Products Corporation, P.O. Box 2470, Cartersville, GA 30120-1692, telephone number 770-382-2144 extension 272, email jcook@cpc-us.com.

The objectives of NIH's and OMB's Information Quality Guidelines are not met by dissemination of a technical report containing factual misrepresentations. For this reason, we request that TR494 be withdrawn until NTP can document that the TR494 test article is not mutagenic to Salmonella typhimurium strains TA98,

TA100, and TA1537 without or with S9 activation. Data demonstrating that the TR494 test article was not mutagenic provided the basis for the December 9, 2004 peer review panel's acceptance of TR494. Only when the non-mutagenicity of the TR494 test article has been demonstrated beyond a reasonable doubt will TR494 be brought into compliance with NIH and OMB Information Quality Guidelines.

If I can answer any questions concerning the contents of this letter, or provide any further information, please telephone me at 770-382-2144 extension 272 or email me at jcook@cpc-us.com.

Sincerely,

/s/

Jerry A. Cook
Technical Director

Cc: Ms. Holli Beckerman Jaffe

Chemical Products Corporation

102 Old Mill Road, S.E.
P.O. Box 2470
Cartersville, Georgia 30120-1692
Phone: 770-382-2144
Fax: 770-386-6053
e-mail: jcook@cpc-us.com

March 28, 2006

Ms. Joyce Bumann, NIEHS Freedom of Information Coordinator
National Institute of Environmental Health Sciences
Mail Drop NH-10
Box 12233
Research Triangle Park, NC 27709

Re: Freedom of Information Act Request relating to NTP Technical Report 494

Dear Ms. Bumann;

Pursuant to the Freedom of Information Act, 5 U.S.C. Sec. 552. I hereby request that a copy of each of the following documents be provided to me:

For each of the five Anthraquinone (CAS # 84-65-1) samples described on pages 248 and pages 251 through 255 of NTP Technical Report 494 (NIH Publication Number 05-3953) as

1. "100% pure sample of anthraquinone"
2. Sample A07496
3. Sample A65343
4. Sample A54984
5. Sample A40147

(1.) Procurement and storage documentation for each of these 5 materials, (2.) chain-of-custody documentation for the aliquot of each of these 5 materials submitted to BioReliance Corporation (Rockville, MD) for the genetic toxicology testing employing Salmonella typhimurium reported in TR494, and (3.) the actual BioRelance Corporation (Rockville, MD) genetic toxicology test reports for each of these 5 materials including a physical description of each sample received and tested.

I am affiliated with a private corporation; and am seeking this information for use in the company's business.

As you are aware, the FOIA requires you to release documents in segregable portions in the event they contain exempt material. For any documents or portions that you deny due to specific FOIA exemption, please provide an index itemizing and describing the documents or portions of documents withheld.

Thank you for your attention to this matter. If I can answer any questions concerning this request, please telephone me at 770-382-2144 Ext. 272 or 770-714-3806 (cell), or email me at jcook@cpc-us.com.

Sincerely,

/s/

Jerry A. Cook, Technical Director
Chemical Products Corporation

DEPARTMENT OF HEALTH & HUMAN SERVICES Public Health Service

National Institutes of Health
National Institute of
Environmental Health Sciences
P. O. Box 12233
Research Triangle Park, NC 27709
Website: www.niehs.nih.gov

April 12, 2006

Mr. Jerry A. Cook
Technical Director
Chemical Products Corporation
102 Old Mill Road, S.E.
P.O. Box 2470
Cartersville, GA 30120-1692

RE: FOIA Case No. 32439

Dear Mr. Cook:

This acknowledges your March 28, 2006 Freedom of Information Act (FOIA) request addressed to me. You requested records relating to five Anthraquinone (CAS # 84-65-1) samples described in NTP Technical Report 494 and cited the following:

1. "100% pure sample of anthraquinone"
2. Sample A07496
3. Sample A65343
4. Sample A54984
5. Sample A40147

(1.) Procurement and storage documentation for each of these 5 materials, (2.) Chain-of-custody documentation for the aliquot of each of these 5 materials submitted to BioReliance Corporation (Rockville, MD) for the genetic toxicology testing employing Salmonella typhimurium reported in TR494, and (3.) The actual BioReliance Corporation (Rockville, MD) genetic toxicology test reports for each of these 5 materials including a physical description of each sample received and tested.

We have queried our National Toxicology Program and Research Contracts Branch for documents responsive to your request. We will send you all material consistent with the exemptions recognized by the Freedom of Information Act. We will do everything possible to comply with your request in a timely manner. Please feel free to call me at 919-541-3411 for additional information or to inquire about the status of your request. My fax number is 919-541-4395.

Provisions of the FOIA allow us to recover part of the cost of complying with your request. We shall charge you for records in accordance with the Department of Health & Human Services' FOIA Regulations as they apply to commercial-use requesters; i.e., you will be charged for duplication at 10-cents per page; and for search and review time at the hourly rate ($19.00,

$38.00 and $69.00) of the searcher and reviewer. If there are any fees associated with processing this request, you will be sent an invoice with our final response. Thank you for your April 4, 2006 e-mail providing a $300.00 fee limit. Should costs exceed that amount, we will get in touch with you.

Sincerely,

/s/

Joyce C. Bumann
Freedom of Information Coordinator, NIEHS

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

National Institutes of Health
National Institute of
Environmental Health Sciences
P.O. Box 12233
Research Triangle Park, N.C. 27709
Website: www.niehs.nih.gov

May 19, 2006

Mr. Jerry A. Cook
Technical Director
Chemical Products Corporation
P.O. Box 2470
Cartersville, Georgia 30120-1692

RE: FOI Case No. 32439

Dear Mr. Cook:

I write in further reference to Joyce Bumann's letter to you dated April 12, 2006, and to provide a final response to your March 28, 2006, Freedom of Information Act (FOIA) request addressed to Ms. Bumann. Ms. Bumann retired at the end of April and I am the new FOIA Coordinator for the Institute. As itemized in the previous letters, you requested multiple records relating to NTP Technical Report 494. Enclosed are 43 pages responsive to your request.

It is Department of Health & Human Services (DHHS) policy to expunge personal identifiers such as: 1) names and contact information of persons who are not listed as key personnel on the contract, 2) names and contact information of subcontractors not listed on the contract, and 3) names and contact information of subcontractor staff who are not listed as key personnel in the contract. This information has been removed in the enclosed material where indicated. If you think material has been omitted that should have been made available to you, please write to me and I will consult with the National Institutes of Health Freedom of Information Officer.

Provisions of the FOIA and DHHS Regulations allow us to recover part of the cost of responding to your request. Enclosed is an invoice for $42.30 to cover the costs associated with responding to your request.

If you have questions about this release, please contact me.

Sincerely,

/s/

Kim L. Minneman
Freedom of Information Coordinator
Phone: (919) 541-3411
Email: minneman@niehs.nih.gov

Enclosures:
Invoice (2)
43 pages

Chemistry Support Services for the NTP

NIH Contract No.: N01-ES-05456

Battelle Project No.: G004110-BJT

NTP ChemTask No.: CHEM06811

CAS No: 84-65-1

BULK CHEMICAL SHIPMENT REPORT

ANTHRAQUINONE

7-064-SHIP-316

January 2, 2003

CAS No: 84-65-1 (anthraquinone; see page 2)	Amount Shipped: See page 2
Battelle Task No.: 7-064-SHIP-316	Shipping Date: 5/13/02
NTP ChemTask No.: CHEM06811	Chemical Lot No.: See page 2
Program Supported: CAR	Last Analyzed Purity: See page 2
Shipped To: [ ] BioReliance Toxicology Test Article Repository 9630 Medical Center Drive Rockville, MD 20850	Recommended Storage Conditions: See page 2

This report was prepared by [ ] and reviewed for accuracy by Melissa Cloud.

Submitted to:

Dr. Cynthia S. Smith

National Institute of Environmental Health Sciences

Mail Drop: EC-06

4401 Commons Building, Suite 100

Research Triangle Park, NC 27709

Chemical:	Anthraquinone	1-Hydroxy-anthraquinone	2-Hydroxy-anthraquinone	1-Nitroanthracene	2-Nitroanthracene	9-Nitroanthracene
CAS No.:	84-65-1	129-43-1	00605-32-3	None Given	3586-69-4	602-60-8
Amount Shipped:	~64.01 g	~8.7 g	~21.0 g	~1.39 g	~8.6 g	~49.2 g
Chemical Lot No.:	34704-76	254-2B	33-217-H	35001-96	34704-91	11112BU
Last Analyzed Purity (Supplier's Certificate of Analysis):	99%	97%	98.7% by GC (FID)	98%	99%	99.4% by HPLC
Recommended Storage Conditions:	Room temperature (~25°C), protected from light	Room temperature (~25°C), protected from light	Room temperature (~25°C), protected from light	Refrigerated (~5°C), protected from light	Refrigerated (~5°C), protected from light	Room temperature (~25°C), protected from light

BATTELLE-BCP

Battelle
. . . Putting Technology To Work

Chemistry Support Services for the NTP

NIH Contract No.: N01-ES-05456

Battelle Project No.: G004110-ATP

NTP ChemTask No.: CHEM05638

CAS No.: 84-65-1

BULK CHEMICAL PROCUREMENT REPORT

ANTHRAQUINONE

6-064-BCP-121

March 5, 2002

CAS No.: 84-65-1	Amounts Received: See Section 2
Battelle Task No.: 6-064-BCP-121	Battelle Receipt Dates: See Section 2
NTP ChemTask No.: CHEM05638	Lot Nos.: See Section 2
Program Supported: CAR	Vendor Purities: See Section 2
Appearances: See Section 2	Storage Conditions: See Section 2

Approved By:

/s/

Donna B. Browning, B.S.
Task Leader

Approved By:

[ ]

[ ]
Discipline Leader, Data Management

Submitted to:

Dr. Cynthia S. Smith
National Institute of Environmental Health Sciences
P.O. Box 12233
111 T.W. Alexander Dr.
Research Triangle Park, NC 27709-2233

BULK CHEMICAL PROCUREMENT REPORT

ANTHRAQUINONE

1 OBJECTIVE

To procure high purity anthraquinone and five additional chemicals (1-hydroxyanthraquinone, 2-hydroxyanthraquinone, 1-nitroanthracene, 2-nitroanthracene, and 9-nitroanthracene) that are potential impurities present in anthraquinone.

2 PROCUREMENT INFORMATION

The six chemicals were procured as follows:

Chemical:	Anthraquinone	1-Hydroxy-anthraquinone	2-Hydroxy-anthraquinone	1-Nitroanthracene	2-Nitroanthracene	9-Nitroanthracene
Supplier:	Cerilliant	ChemService	Narchem Corporation	Cerilliant	Cerilliant	Aldrich
Date Procured:	1/10/01	10/3/00	10/18/00	10/18/00[b] & 8/2/01[c]	10/18/00	10/3/00
Date Received:	3/1/01	10/6/00	9/4/01	8/31/01[b] & 12/10/01[c]	4/13/01	10/9/00
Lot No.:	34704-76	254-2B	33-217-H	35001-25 & 35001-96	34704-91	11112BU
Amount Received:	91 g	10 g	25 g	1.2 g[b] & 2.5 g[c]	10 g	50 g
Vendor Purity[a]:	99%	97%	98.7% by GC (FID)	99%[b] & 98%[c]	99%	99.4% by HPLC
Appearance:	Yellow needle-like crystalline solid	Dark yellow powder	Greenish-yellow powder	Brown powder[c]	Yellow powder	Yellow long thin crystalline powder
Storage Conditions:	Room temperature (~25°C)	Room temperature	Room temperature	~5°C	~5°C	Room temperature

a. Suppliers' Certificates of Analysis are attached.
b. Lot No. 35001-25.
c. Lot No. 35001-96.

3 MSDS

Copies of the Material Safety Data Sheets are attached.

4 ACKNOWLEDGMENTS

This report was prepared by Carla Downard and reviewed for accuracy by [ ].

CERTIFICATES OF ANALYSIS

[subcontractor]

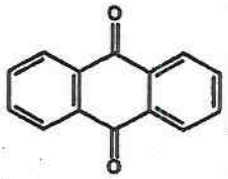
[Subc #]

Certificate of Analysis

Anthraquinone

9,10-Anthracenedione

Catalog Number:	CSQ-2065R
Lot Number:	34704-76
CAS Number:	84-65-1
Chemical Formula:	$C_{14}H_8O_2$
Molecular Weight:	208.22
Chemical Purity:	99%[1]
Storage:	Protect from light, store at room temperature.
Handling:	See MSDS for handling instructions.
Intended Use:	For laboratory use only.



[1] 9-nitroanthracene not detected in this product above 400 parts per billion (400 ng/g).

Spectral and Physical Data

Elemental Analysis

	%C	%H	%O
Calculated	80.76	3.87	15.37
Analyzed	80.39	4.12	15.21

Melting Point

284.8°C (Literature: 284-286°C)

TLC Analysis

Basic Alumina, Hexane::Ethyl Acetate (80::20)
Single Spot, R_f = 0.46

DSC Analysis

Melting Point:	284.8°C
Temperature Program:	265°C to 305°C at 2°C/min
Molar Purity:	100%

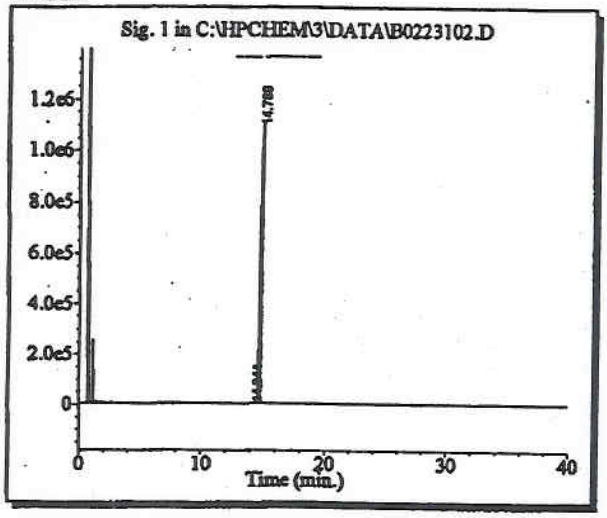
[ ] (formerly [ ]) certifies that this material meets or exceeds the purity value stated in this data sheet. Purity and identity are established using a variety of chromatographic and spectroscopic methods. The results of these analyses are included in this data package.

Authorized Signature: [ ]

[subcontractor address]

Spectral and Physical Data (cont.)

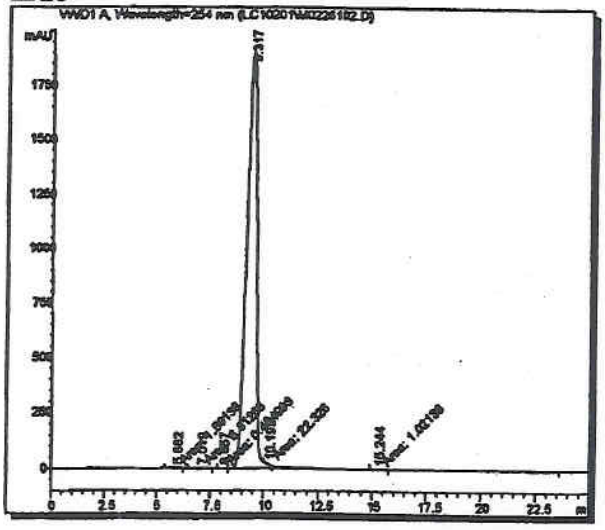
GC/FID



Column:	DB-5ms, 30 m x 0.53 mm ID, 1.5 um film thickness
Temp Program:	40°C to 140°C at 40°C/min
	140°C to 300°C at 5°C/min hold 5.5 min
Injector Temp:	Cool-on-Column
Detector Temp:	325°C
Data File Name:	C:\HPCHEM\3\DATA\B0223102.D
Operator:	[ ]
Instrument:	GC#2
Sample Name:	34704-76
Method File:	B03G.MTH
Acquired:	February 23, 2001 5:59 PM

Peak #	Ret Time	Area	Height	Area %
1	14.34	12471	1576	0.17
2	14.79	7220559	1095426	99.83

HPLC



Column:	Betasil Phenyl 4.6 x 150 mm
Mobile Phase:	Acetonitrile::0.01M Phosphate Buffer (70::30)
Flow Rate:	0.5 mL/min
Wavelength:	254 nm
Data File Name:	C:\HPCHEM\1\DATA\LC10201\M0226102.D
Operator:	[ ]
Instrument:	HPLC 1
Sample Name:	34704-76
Method File:	PURITY5.MTH
Acquired:	February 26, 2001 3:08 PM

Peak #	Ret Time	Area	Height	Area %
1	5.88	1591	110	0.00
2	7.02	6813	456	0.01
3	8.06	404	24	0.00
4	9.32	61665300	1912540	99.95
5	10.19	22326	2078	0.04
6	15.24	1021	46	0.00

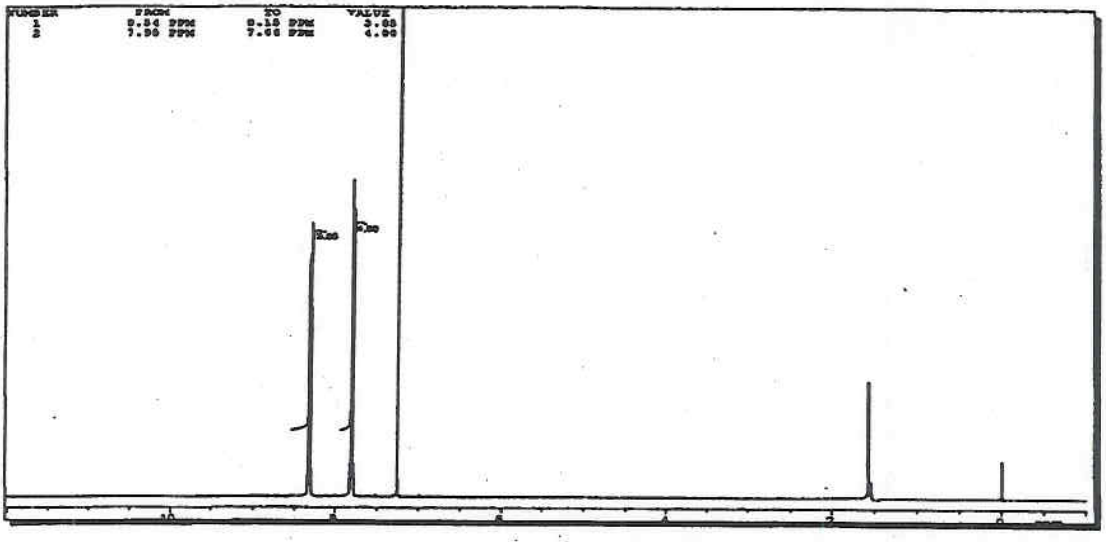
[subcontractor]

[ ]

Spectral and Physical Data (cont.)

^{1}H NMR

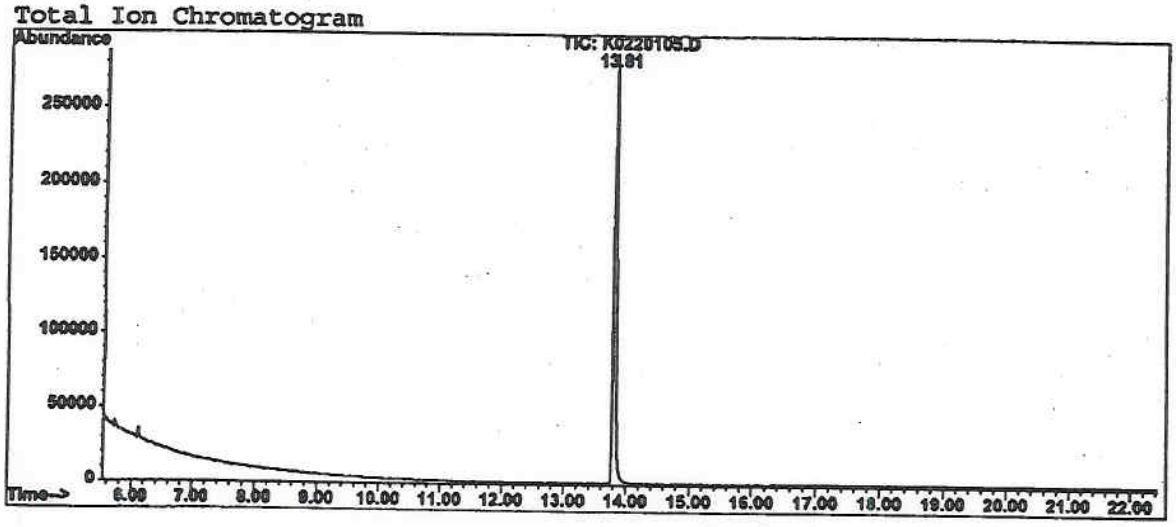
Instrument: GE QE 300
Solvent: Chloroform-D
Reference: TMS



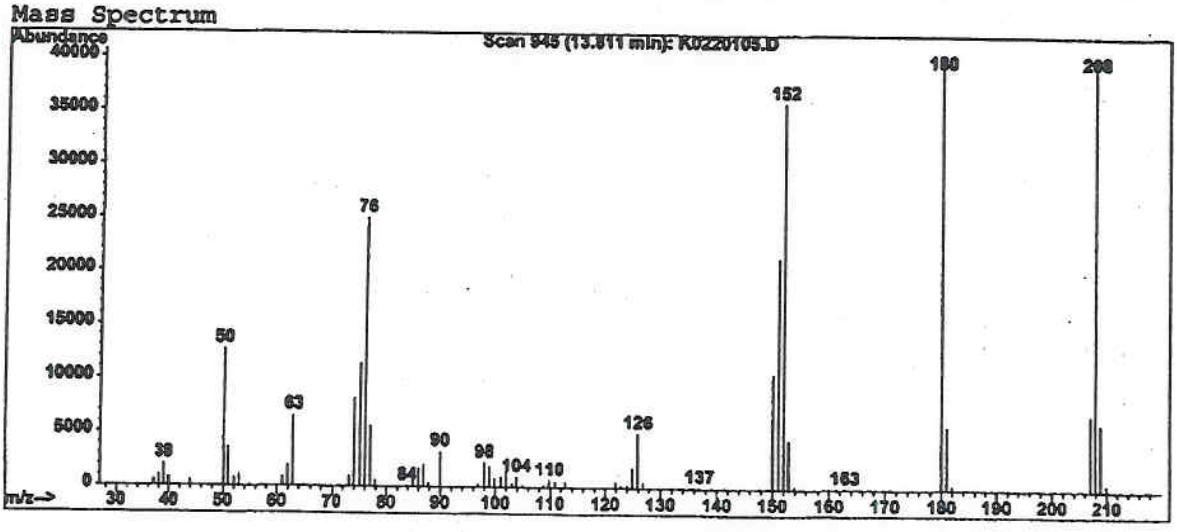
[subcontractor address]

Compound Name	: Anthraquinone
Lot Number	: 34704-76 (@100ppm)
Instrument	: HP 5971 MS/HP 5890 II GC
Operator-Inst ID	: [redacted]
Date Reported	: Wed Feb 21 10:53:10 2001
Column Type	: DB-5ms, 30m x 0.25mm ID, 0.25um film thickness
Temp. Program	: 70°C (2) to 300°C @ 15°C/min (2.67)
Injector Temp.	: Cool on-column
Carrier Gas	: Helium
Flow Rate (mL\min)	: 0.80 mL/min
Transfer Line Temp.	: 280°C
Scan Range	: 35-550

Total Ion Chromatogram



Mass Spectrum



[subcontractor]

CERTIFICATE OF ANALYSIS

INVOICE #: [sube #]
PO #: 10400

CATALOG #: O-931

CAS #: 129-43-1

DESCRIPTION: 1-Hydroxyanthraquinone

LOT #: 254-2B

PURITY: 97%

EXPIRATION DATE: 10/06

[subcontractor] guarantees the purity of this chemical ± 0.5% deviation prior to the expiration date shown on the label and exclusive of any customer contamination.

Two or more of the following methods of analysis are used to determine purity: Melting point, refractive index, titration, IR, TLC, GC/FID, GC/TCD, GC/ECD, GC/MS, HPLC or DSC.

Our standards are suitable for use with all EPA methods.

Certified By:

[ ]

[ ]

[subcontractor]

CERTIFICATE OF ANALYSIS

Date: August 31, 2001

[subcontractor]

[ ]

Chemical	:	**2-Hydroxyanthraquinone**	
CAS Number	:	00605-32-3	
Lot Number	:	33-217-H (25 g)	
Narchem Specifications:		2-Hydroxyanthraquinone	97% min.
Method of Analysis	:	**Gas Chromatography (FID)**	
Results	:	2-Hydroxyanthraquinone	98.7%
Conclusion	:	Passes [ ]	
Signed by	:	_____ [ ]	_____

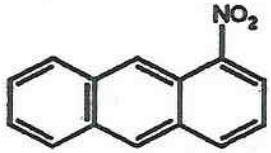
[subcontractor]

[subc.]
[#]

Certificate of Analysis

1-Nitroanthracene

Catalog Number:	CSQ-2033
Lot Number:	35001-25
Chemical Formula:	$C_{14}H_9NO_2$
Molecular Weight:	223.23
Chemical Purity:	99%
Storage:	Protect from light, refrigerate.
Handling:	See MSDS for handling instructions.
Intended Use:	For laboratory use only.



Spectral and Physical Data

Elemental Analysis

	%C	%H	%N
Calculated	75.33	4.06	6.27
Analyzed	75.23	4.13	5.97

Melting Point

117.2°C

TLC Analysis

Neutral Alumina, Hexane:Ethyl Acetate (75:25)
Single Spot, R_f = 0.49

DSC Analysis

Melting Point:	117.2°C
Temperature Program:	50°C to 300°C at 5°C/min
Molar Purity:	99.95%

[ ] certifies that this material meets or exceeds the purity value stated in this data sheet. Purity and identity are established using a variety of chromatographic and spectroscopic methods. The results of these analyses are included in this data package.

[ ]

Authorized Signature:

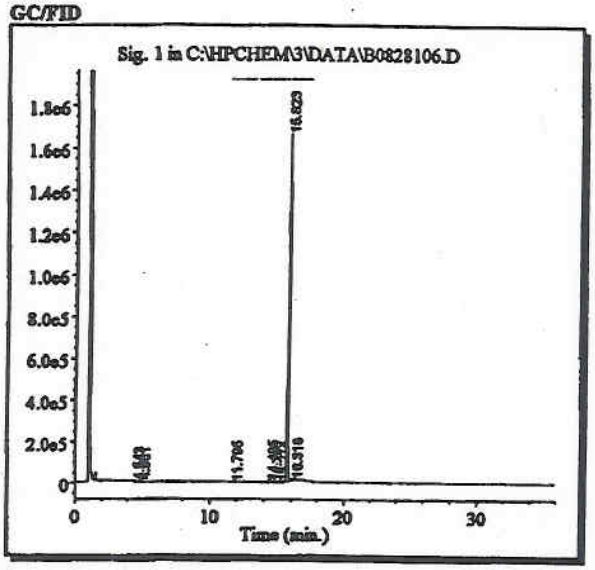
[ ]

[subcontractor address]

[Dulz.]
[L #]

Spectral and Physical Data (cont.)

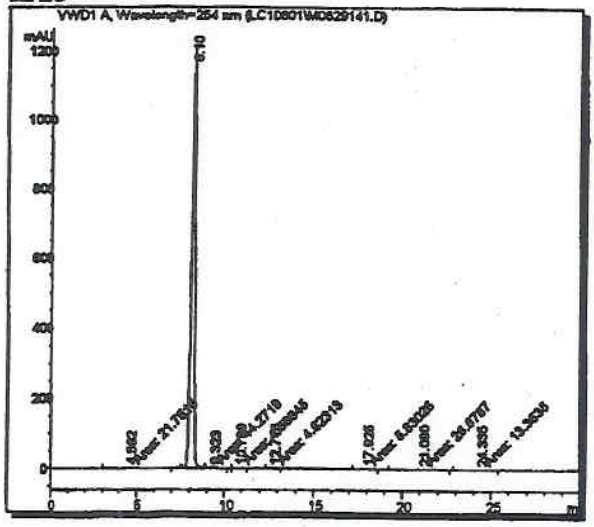
GC/FID



Column:	DB-5ms, 30 m x 0.53 mm ID, 1.5 um film thickness
Temp Program:	60°C to 180°C at 15°C/min
	180°C to 300°C at 10°C/min hold 16 min
Injector Temp:	Cool-on-Column
Detector Temp:	325°C
Data File Name:	C:\HPCHEM\3\DATA\B0828106.D
Operator:	[ ]
Instrument:	GC#2
Sample Name:	35001-25
Method File:	FUR15.MTH
Acquired:	August 28, 2001 11:26 AM

Peak #	Ret Time	Area	Height	Area %
1	4.54	15067	8570	0.19
2	4.96	7754	4491	0.10
3	11.80	6541	2360	0.08
4	14.43	29861	7823	0.38
5	14.79	2747	723	0.03
6	15.27	1485	531	0.02
7	15.82	7824730	1658858	99.02
8	16.32	13894	4644	0.18

HPLC



Column:	Betasil Phenyl 4.6 x 150 mm
Mobile Phase:	Acetonitrile::0.01M Phosphate Buffer (70::30)
Flow Rate:	0.5 mL/min
Wavelength:	254 nm
Data File Name:	C:\HPCHEM\1\DATA\LC10801\M0829141.D
Operator:	[ ]
Instrument:	HPLC#3
Sample Name:	35001-25
Method File:	3.M
Acquired:	August 29, 2001 5:17 PM

Peak #	Ret Time	Area	Height	Area %
1	4.56	21.75	0.31	0.13
2	8.10	16255.10	1205.44	99.26
3	9.32	44.27	1.52	0.27
4	10.80	4.59	0.19	0.03
5	12.72	4.62	0.24	0.03
6	17.93	5.83	0.22	0.04
7	21.09	26.68	0.33	0.16
8	24.34	13.35	0.28	0.08

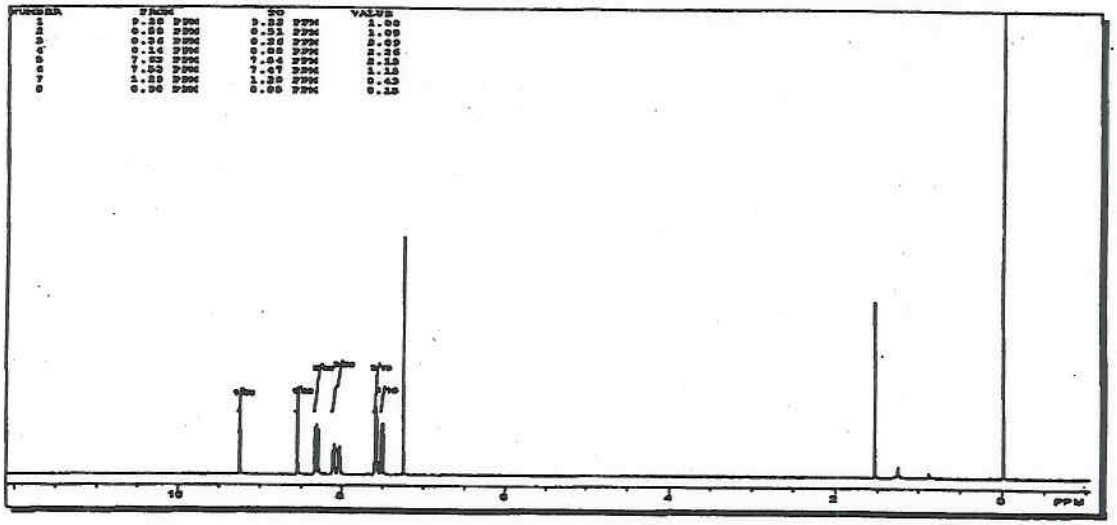
[subcontractor]

[sub. #]

Spectral and Physical Data (cont.)

^{1}H NMR

Instrument:	**GE QE 300**
Solvent:	**Chloroform-D**
Reference:	**TMS**

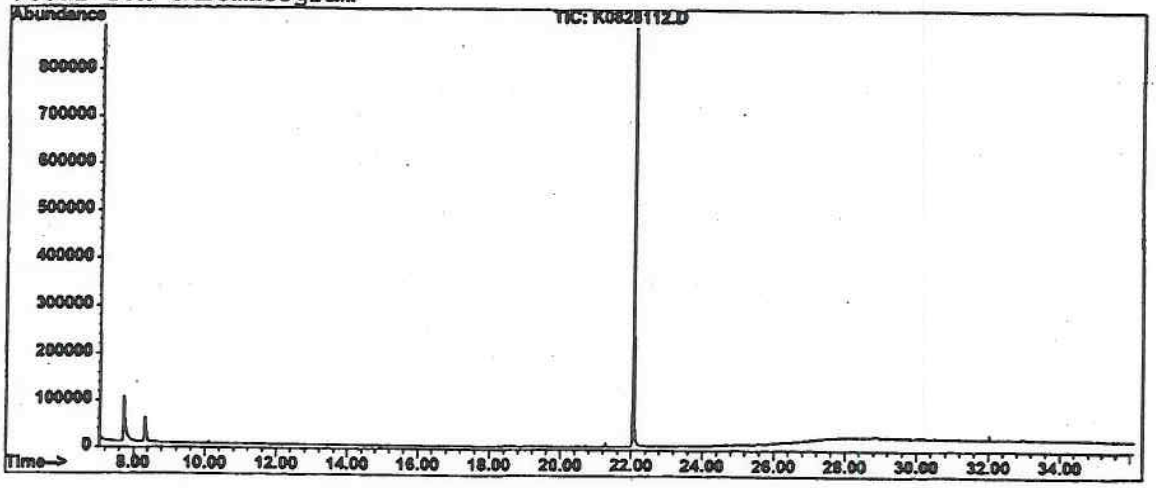


[subcontractor address]

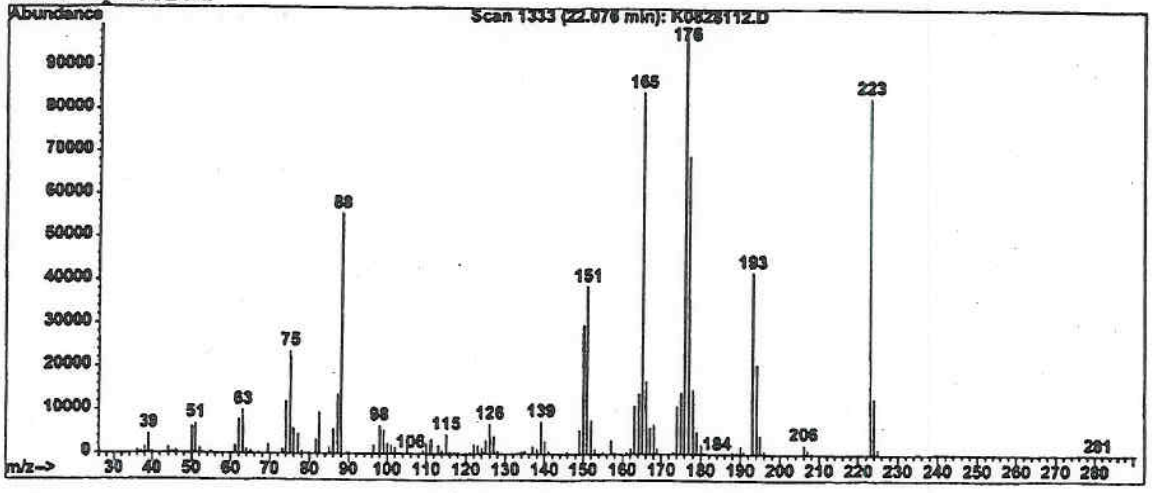
Compound Name	: 1-Nitroanthracene
Lot Number	: 35001-25
Instrument	: HP 5971 MS/HP 5890 II GC
Operator-Inst ID	[ ]
Date Reported	: Tue Aug 28 16:24:57 2001
Column Type	: DB-5ms, 30m x 0.25mm ID, 0.25um film thickness
Temp. Program	: 50°C to 200°C @ 10°C/min, 200°C to 310°C @ 10°C/min
Injector Temp.	: Cool on-column
Carrier Gas	: Helium
Flow Rate (mL\min)	: 0.80 mL/min
Transfer Line Temp.	: 280°C

Scan Range : 35-550

Total Ion Chromatogram



Mass Spectrum



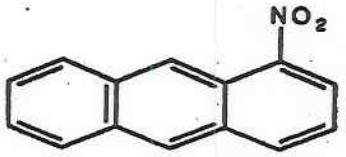
[subcontractor]

[sub. #]

Certificate of Analysis

1-Nitroanthracene

Catalog Number:	CSQ-2458
Lot Number:	35001-96
Chemical Formula:	$C_{14}H_9NO_2$
Molecular Weight:	223.23
Chemical Purity:	98%
Storage:	Protect from light, refrigerate.
Handling:	See MSDS for handling instructions.
Intended Use:	For laboratory use only.



Spectral and Physical Data

Elemental Analysis

	%C	%H	%N
Calculated	75.33	4.06	6.27
Analyzed	75.14	4.04	6.25

DSC Analysis

Melting Point:	114.3°C
Temperature Program:	75°C-300°C @ 2°C/min
Molar Purity:	99.97

TLC Analysis

Neutral Alumina, Hexane:Methylene Chloride (70:30), Iodine chamber
Single spot, $R_f = 0.63$

[ ] certifies that this material meets or exceeds the purity value stated in this data sheet. Purity and identity are established using a variety of chromatographic and spectroscopic methods. The results of these analyses are included in this data package.

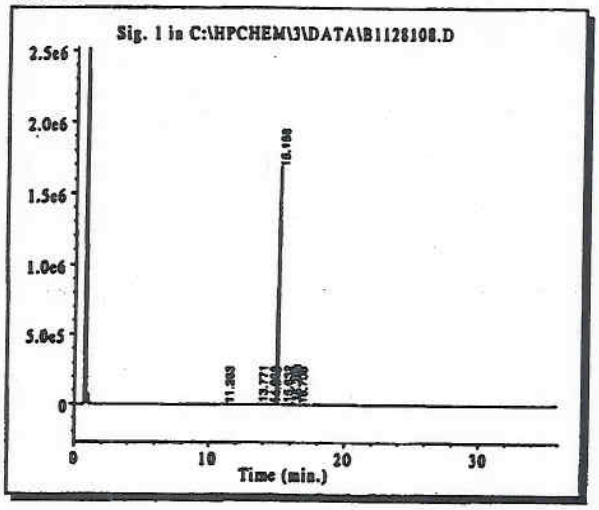
Authorized Signature: [ ]

[subcontractor address]

[Batch #]

Spectral and Physical Data (cont.)

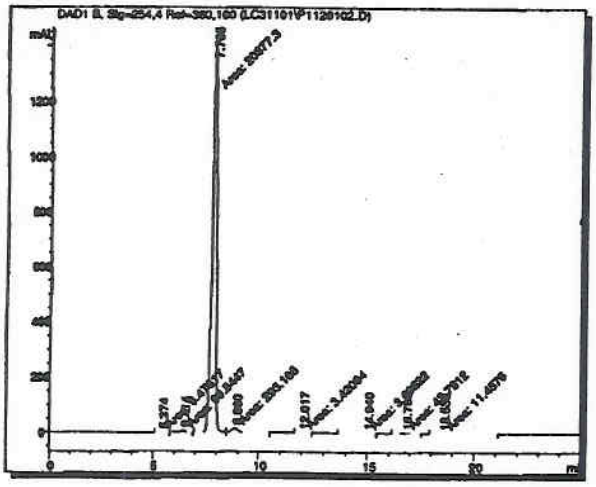
GC/FID



Column:	DB-5ms, 30 m x 0.53 mm ID, 1.5 um film thickness
Temp Program:	60°C to 180°C at 15°C/min
	180°C to 280°C at 10°C/min hold 18 min
Injector Temp:	Cool-on-Column
Detector Temp:	325°C
Data File Name:	C:\HPCHEM\3\DATA\B1128108.D
Operator:	[ ]
Instrument:	GC#2
Sample Name:	35001-96
Method File:	PUR15.MTH
Acquired:	November 28, 2001 1:31 PM

Peak #	Ret Time	Area	Height	Area %
1	11.28	1131	435	0.02
2	13.77	18714	7151	0.26
3	14.61	3595	865	0.05
4	14.85	4459	1599	0.06
5	15.16	7034845	1684708	98.69
6	15.63	14272	5398	0.20
7	16.30	37371	13797	0.52
8	16.71	13985	3977	0.20

HPLC



Column:	Betasil Phenyl 4.6 x 150 mm
Mobile Phase:	Acetonitrile::0.01M Phosphate Buffer (70::30)
Flow Rate:	0.5 mL/min
Wavelength:	254 nm
Data File Name:	P1128102.D
Operator:	[ ]
Instrument:	HPLC3
Sample Name:	35001-96
Method File:	1001.M
Acquired:	November 28, 2001 5:20 PM

Peak #	Ret Time	Area	Height	Area %
1	5.37	6.47617	0.58494	0.03
2	6.41	99.84472	5.64234	0.48
3	7.77	20377.3	1398.54	97.77
4	8.86	293.16476	13.8347	1.41
5	14.94	3.69622	0.10417	0.02
6	16.76	42.79115	1.41631	0.21
7	18.53	11.45762	0.10134	0.06
8	22.64	4.72318	0.10755	0.02

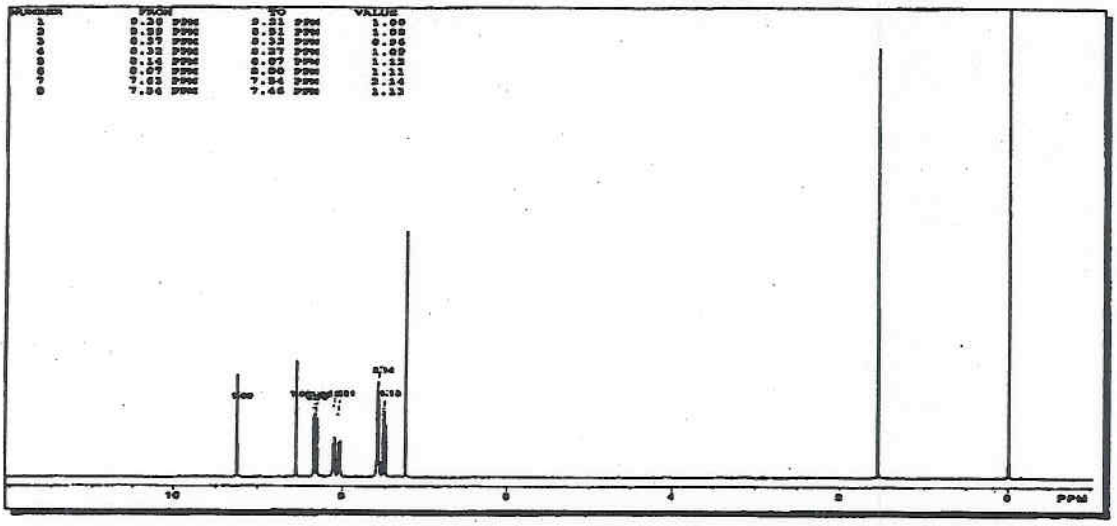
[subcontractor]

[Subc. #]

Spectral and Physical Data (cont.)

^{1}H NMR

Instrument: GE QE 300
Solvent: Chloroform-D
Reference: TMS



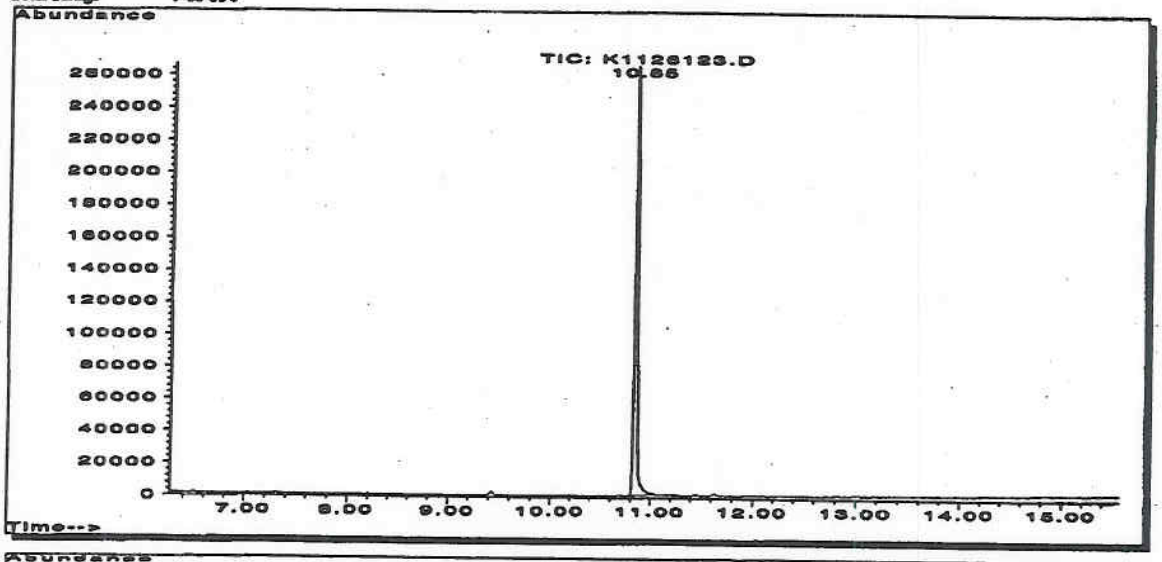
[subcontractor address]

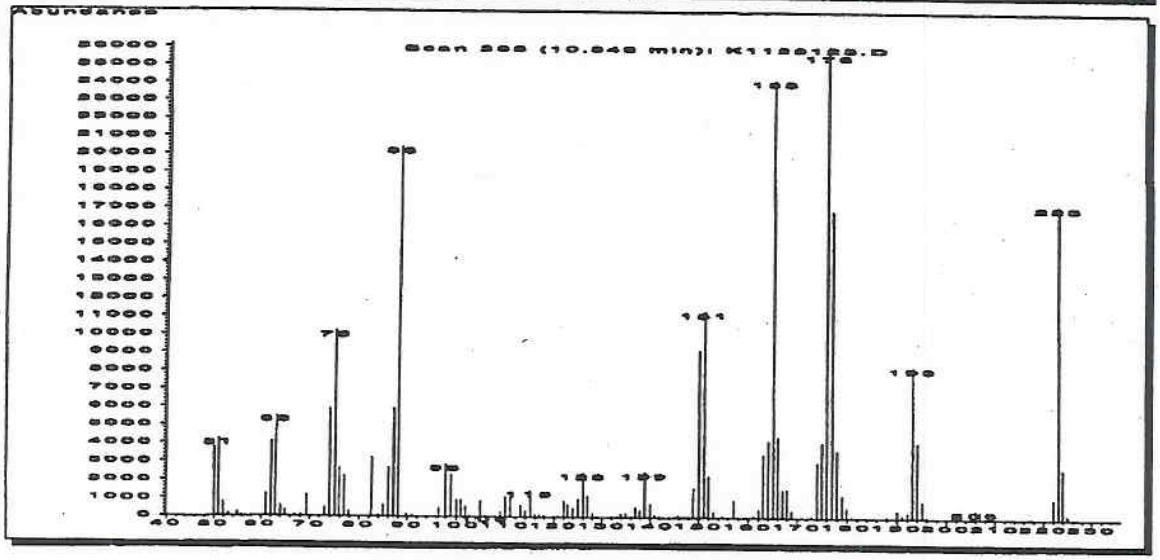
[dupe #]

Spectral and Physical Data (cont.)

GC/MS

Compound Name	: CSQ-2458
Lot Number	: 35001-96
Instrument	: HP 5971 MS/HP 5890 II GC
Operator-Inst ID	: [ ]
Date Reported	: Tue Nov 27 10:05:53 2001
Column Type	: DB-5ms, 30m x 0.25mm ID, 0.25um film thickness
Temp. Program	: 50°C to 200°C @ 40°C/min, 200°C to 310°C @ 10°C/min
Injector Temp.	: Cool on-column
Carrier Gas	: Helium
Flow Rate (mL/min)	: 0.80 mL/min
Transfer Line Temp.	: 280°C
Scan Range	: 35-550





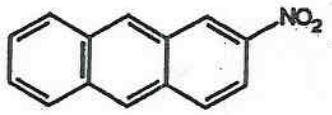
[subcontractor]

[sub. #]

Certificate of Analysis

2-Nitroanthracene

Catalog Number:	CSQ-2034
Lot Number:	34704-91
Chemical Formula:	$C_{14}H_9NO_2$
Molecular Weight:	223.23
Chemical Purity:	99%
Storage:	Protect from light, refrigerate.
Handling:	See MSDS for handling instructions.
Intended Use:	For laboratory use only.



Spectral and Physical Data

Elemental Analysis

	%C	%H	%N
Calculated	75.33	4.06	6.27
Analyzed	75.22	4.24	6.16

Melting Point

180.8°C (Literature: 181-182°C)

TLC Analysis

Neutral Alumina, Hexane::Ethyl Acetate::Methanol (80::10::10)
Single Spot, R_f = 0.57

DSC Analysis

Melting Point:	180.8°C
Temperature Program:	150°C to 250°C at 2°C/min
Molar Purity:	99.81%

[ ] (formerly [ ]) certifies that this material meets or exceeds the purity value stated in this data sheet. Purity and identity are established using a variety of chromatographic and spectroscopic methods. The results of these analyses are included in this data package.

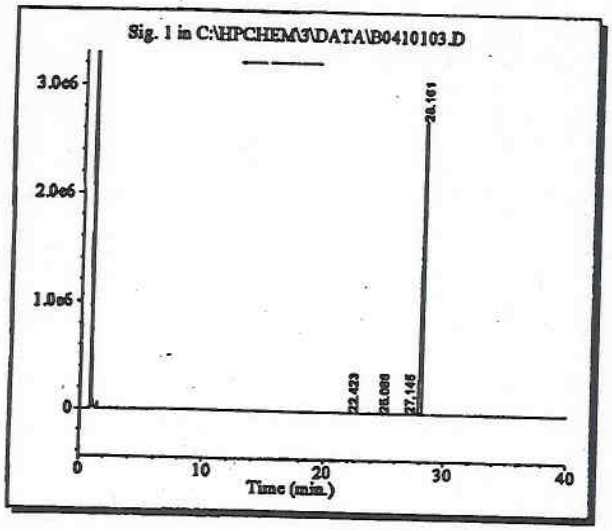
Authorized Signature:

[subcontractor address]

Paulo. 7
[#]

Spectral and Physical Data (cont.)

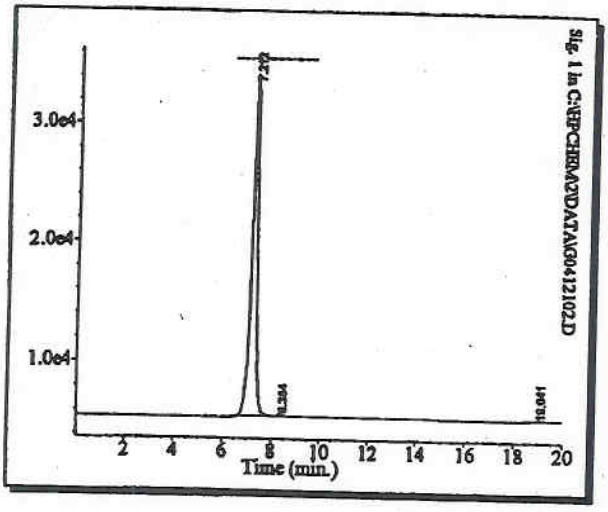
GC/FID



Column:	DB-5ms, 30 m x 0.53 mm ID, 1.5 um film thickness
Temp Program:	40°C to 80°C at 40°C/min
	80°C to 175°C at 5°C/min
	175°C to 300°C at 10°C/min hold 7.5 min
Injector Temp:	Cool-on-Column
Detector Temp:	325°C
Data File Name:	C:\HPCHEM\3\DATA\B0410103.D
Operator:	[ ]
Instrument:	GC#2
Sample Name:	34704-91
Method File:	B03J.MTH
Acquired:	April 10, 2001 11:43 AM

Peak #	Ret Time	Area	Height	Area %
1	22.42	67789	5135	0.46
2	25.07	18875	3261	0.13
3	27.15	32709	5162	0.22
4	28.16	1.48E+07	2706426	99.20

HPLC



Column:	Betasil Phenyl 4.6 x 150 mm
Mobile Phase:	Acetonitrile::0.01M Phosphate Buffer (70::30)
Flow Rate:	0.6 ml/min
Wavelength:	254 nm
Data File Name:	C:\HPCHEM\2\DATA\G0412102.D
Operator:	[ ]
Instrument:	HPLC#2
Sample Name:	34704-91
Method File:	PURITY2.MTH
Acquired:	April 12, 2001 10:42 AM

Peak #	Ret Time	Area	Height	Area %
1	7.21	438753	28641	99.01
2	8.38	2437	171	0.55
3	19.04	1971	66	0.44

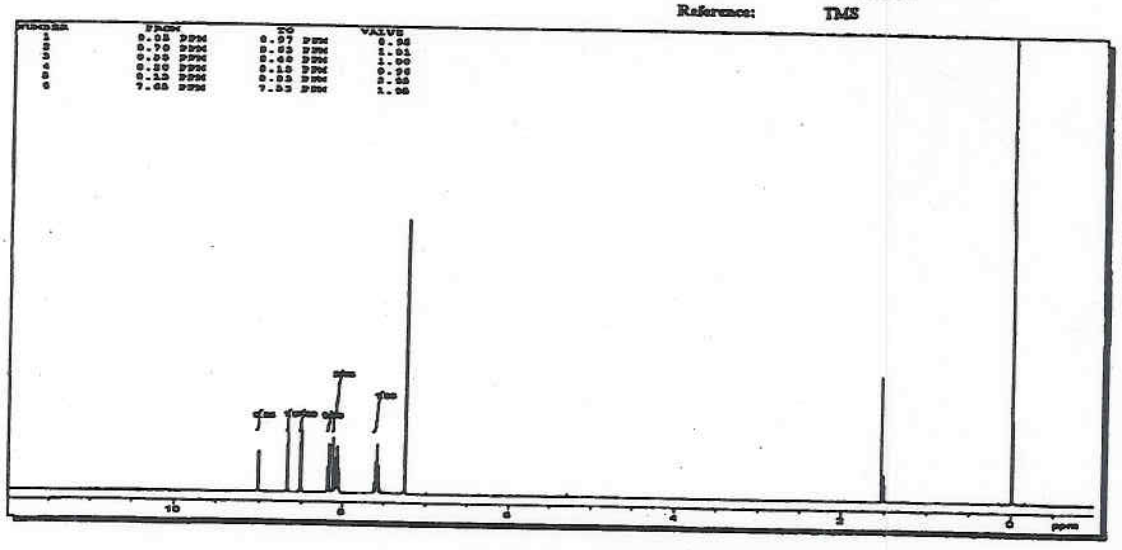
[subcontractor]

[subc. #]

Spectral and Physical Data (cont.)

^{1}H NMR

Instrument: GE QE 300
Solvent: Chloroform-D
Reference: TMS

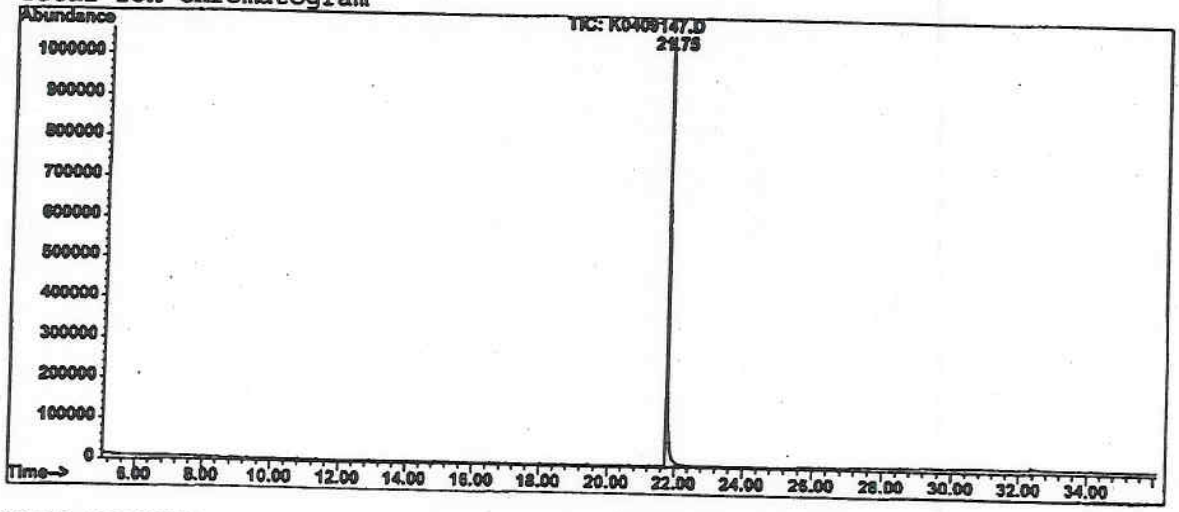


[subcontractor address]

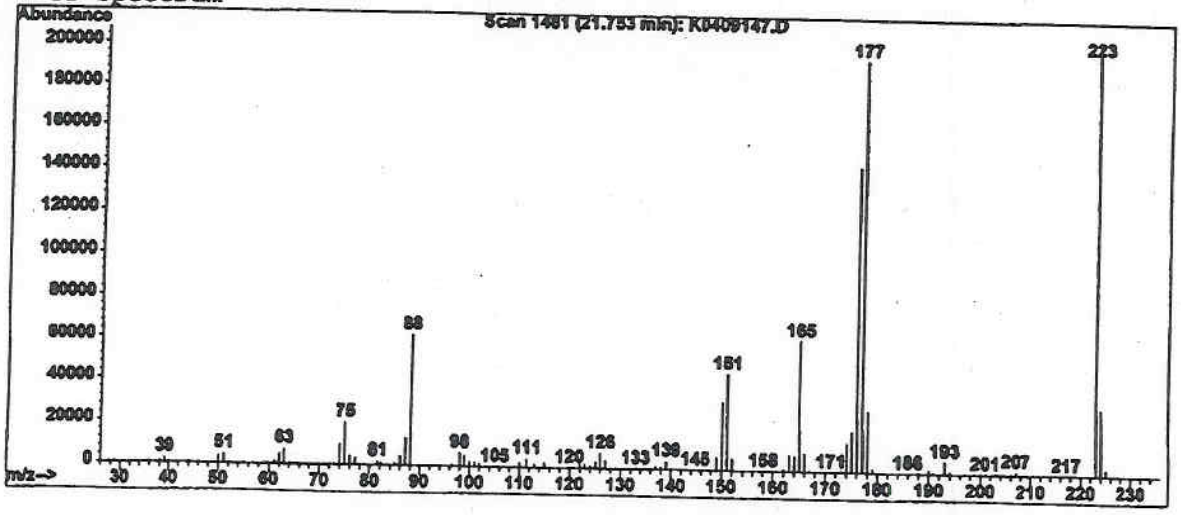
Compound Name	: 2-Nitroanthracene
Lot Number	: 34704-91
Instrument	: HP 5971 MS/HP 5890 II GC
Operator-Inst ID	: [ ]
Date Reported	: Thu Apr 12 15:35:35 2001
Column Type	: DB-5ms, 30m x 0.25mm ID, 0.25um film thickness
Temp. Program	: 50°C to 200°C @ 40°C/min, 200°C to 310°C @ 10°C/min
Injector Temp.	: Cool on-column
Carrier Gas	: Helium
Flow Rate (mL\min)	: 0.80 mL/min
Transfer Line Temp.	: 280°C

Scan Range : 35-550

Total Ion Chromatogram



Mass Spectrum



CERTIFICATE OF ANALYSIS

BATTELLE
DONNA BROWNING
614 424 5221

PO NBR:

PRODUCT NUMBER: N1020-9 LOT NUMBER: 11112BU

PRODUCT NAME: 9-NITROANTHRACENE, 97%

FORMULA: C14H9NO2 FORMULA WEIGHT: 223.23

APPEARANCE	GOLD CRYSTALLINE POWDER
INFRARED SPECTRUM	CONFORMS TO STRUCTURE AND STANDARD AS ILLUSTRATED ON PAGE 2350B OF EDITION I, VOLUME 2 OF "THE ALDRICH LIBRARY OF FT-IR SPECTRA".
ELEMENTAL ANALYSIS	CARBON 75.12% HYDROGEN 4.00% NITROGEN 6.17%
HIGH PRESSURE LIQUID CHROMATOGRAPHY	99.4 %
QUALITY CONTROL ACCEPTANCE DATE	FEBRUARY, 1999

[Subcontractor]
[OCTOBER 12, 2000]

[Subcontractor]

[ ] warrants that its products conform to the information contained in this and other Aldrich publications. Purchaser must determine the suitability of the product for its particular use. See reverse side of invoice or packing slip for additional terms and conditions of sale.

015 REV-11/92

** TOTAL PAGE.01 **

MATERIAL SAFETY DATA SHEETS

[Subcontractor]

[ ]

MATERIAL SAFETY DATA SHEET

IDENTITY: Anthraquinone
CAS NUMBER: 84-65-1

SECTION I

Manufacturer: [ ]

Emergency Telephone Number: [ ]
Date Prepared: February 27, 2001

SECTION II - HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

Hazardous Components	OSHA PEL	ACGIH TLV	Other Limits	%
Anthraquinone	N/A	N/A	--	100

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point(degrees C): 377

Specific Gravity (Water=1): 1.44

Vapor Pressure (mmHg): 1 @ 190°C

Melting Point(degrees C): 284-286°C

Vapor Density (Air=1): 7.16

Evaporation Rate (Butyl Acetate=1): N/A

Solubility in Water: Insoluble.

Appearance and Odor: Pale yellow needles

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: 185°C (365°F)
Method Used: Closed Cup

Flammable Limits
LEL: N/A **UEL:** N/A

Extinguishing Media: Dry chemical, carbon dioxide or Halon extinguisher.

Special Fire Fighting Procedures: N/A

Unusual Fire and Explosion Hazards: N/A

The information contained herein is believed to be accurate and is supplied in good faith. [ ] makes no warranty with respect to and assumes no legal responsibility for use of or reliance upon this information. Individuals receiving this data must exercise their own judgement in determining its suitability for a particular purpose.

CSQ-2065 R

[Subcontractor address]

SECTION V - REACTIVITY DATA

Stability - Unstable:
Stable: X

Conditions to Avoid: High temperatures, ignition sources dust generation, light

Incompatible Materials: Oxidizers, flame

Hazardous Comp Pdts: Toxic fumes of carbon monoxide and carbon dioxide.

Hazardous Polymerization - May Occur:
Will Not Occur: X

Conditions to Avoid: N/A

SECTION VI - HEALTH HAZARD DATA

Routes of Entry: Inhalation? Yes Skin? Yes Ingestion? Yes

Health Hazards: Exposure to Anthraquinone may result in irritation and skin allergy.

Toxicity: LD_{50}/LC_{50} Inhalation, rat LC_{50} >1300 mg/m³/4H: oral mouse: LD_{50} = > 5 g/kg: skin LD_{50} =>5g/kg

Carcinogenicity: NTP? N/A IARC? N/A OSHA? N/A

Symptoms of Exposure: Exposure to Anthraquinone may cause irritation of the eyes and respiratory tract. If swallowed, it may cause gastric irritation. Long-term contact may result in pigmentation or cancer of the skin.

Medical Conditions Aggravated by Exposure: N/A

Emergency and First Aid Procedures: If ingested, give victim large quantities of liquid and transport to a medical facility. In case of external exposure, wash affected areas with large amounts of water and transport to a medical facility. If breathing is disturbed, give artificial respiration while transporting to a medical facility.

SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material is Released or Spilled: Remove all sources of ignition. Use absorbent paper to pick up all spilled material. If necessary, soak absorbent paper in an appropriate solvent such as toluene or alcohol to pick up remaining traces.

Waste Disposal Method: Waste materials should be disposed of under conditions which meet Federal, State, and Local environmental control regulations.

Precautions to be Taken in Handling and Storing: Store at room temperature.
Protect from light.

Other Precautions: N/A

SECTION VIII - CONTROL MEASURES

Respiratory Protection: Avoid inhalation of vapors. Cartridge type respirator with organic vapor cartridges recommended.

Ventilation -Local Exhaust: Handle in an efficient fume hood or glove box.
General Mechanical: Normal laboratory air exchange.
Special: N/A

Protective Gloves: Use two dissimilar types. PVC or Neoprene over latex.

Other Protective Clothing or Equipment: Lab coat or Tyvek® suit recommended.

Work/Hygienic Practices: Only experienced personnel should be allowed to handle this material.

[Subc. #]

[subcontractor]
MATERIAL SAFETY DATA SHEET

0-931

Invoice: [ ] PO: 10400

Pr ted: 10/04/2000
Lab Revised: April 18, 1997

SECTION 1 - CHEMICAL PRODUCT and COMPANY IDENTIFICATION

Catalog Number: 0-931
Description: 1-Hydroxy-9.10-anthracenedione
Other Name(s): 1-Hydroxyanthraquinone

Supplied by [ ]
EMERGENCY PHONE: [ ]

SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS

CAS No.: 129-43-1
Description: 1-Hydroxy-9.10-anthracenedione
EINECS No.: Not Available
Hazard Symbols: Not Available

SECTION 3 - HAZARDS IDENTIFICATION

Contact lenses should not be worn in the laboratory.
All chemicals should be considered hazardous - Avoid direct physical contact!
Can cause skin irritation. Can be irritating to mucous membranes.
Va s and/or direct eye contact can cause severe eye burns. Can cause eye irritation.
May be harmful if absorbed through the skin. May be harmful if inhaled.
May be harmful if swallowed.
Prolonged exposure may cause nausea/headache/dizziness and/or eye damage.

SECTION 4 - FIRST AID MEASURES

An antidote is a substance intended to counteract the effect of a poison. It should be administered only by a physician or trained emergency personnel. Medical advice can be obtained from a POISON CONTROL CENTER.

In case of contact: Flush eyes continuously with water for 15-20 minutes. Flush skin with water for 15-20 minutes. If no burns have occurred-use soap and water to cleanse skin.
If inhaled remove patient to fresh air. Administer oxygen if patient is having difficulty breathing. If patient has stopped breathing administer artificial respirations.
If patient is in cardiac arrest administer CPR.
Continue life supporting measures until medical assistance has arrived.

SECTION 5 - FIRE AND EXPLOSION DATA

Flash Point: Not Available
Extinguishing Media:
Carbon dioxide, dry chemical powder or spray.
Upper Explosion Limit: Not Available
Lower Explosion Limit: Not Available

SECTION 5 - FIRE AND EXPLOSION DATA CONTINUED

Auto ignition Temperature: Not Available
NFPA Hazard Rating: Not Available

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Spills or leaks: Evacuate area. Wear appropriate OSHA regulated equipment. Ventilate area.
Sweep up and place in an appropriate container. Hold for disposal.
Wash contaminated surfaces to remove any residues.
Remove contaminated cloting and wash before reuse.

SECTION 7 - HANDLING AND STORAGE

Handling:
This chemical should be handled only in a hood. Eye shields should be worn.
Use appropriate OSHA/MSHA approved safety equipment.
Avoid contact with skin, eyes and clothing. Avoid ingestion and inhalation
Wash thoroughly after handling.

Storage:
Store in a cool dry place. Store only with compatible chemicals.
Keep tightly closed.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

OSHA PEL (TWA): Not Available
ACGIH TLV (TWA): Not Available
ACGIH TLV (STEL): Not Available

Personal Protective Equipment
Eyes: Wear Safety Glasses.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to minimize contact with skin.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 requirements must be followed whenever workplace conditions warrant a respirator's use.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Color:	Yellow
Phase:	Crystalline solid
Melting Point:	198 C
Boiling Point:	Not Available
Specific Gravity:	Not Available
Vapor Pressure:	Not Available
Vapor Density:	Not Available
Solubility in Water:	Insoluble (immiscible)
Odor:	Pungent, acrid
Evaporation Rate (Butyl acetate=1):	Not Available

SECTION 10 - STABILITY AND REACTIVITY

Incompatible with strong oxidizing agents. Decomposition liberates toxic fumes. Decomposition products are corrosive.

SECTION 11 - TOXICOLOGY INFORMATION

RTECS: CB7178000
Oral Rat or Mouse LD50: Not Available
Dermal Rat or Mouse LD50: N/A
Rat or Mouse LC50: Not Available

Carcinogenicity
OSHA: No
IARC: No
NTP: No
ACGIH: No
NIOSH: No
Other: No

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicity: Not Available
Environmental Fate: Not Available

SECTION 13 - DISPOSAL CONSIDERATIONS

DISPOSAL: Burn in a chemicals incinerator equipped with an afterburner and scrubber.

SECTION 14 - TRANSPORTATION INFORMATION

Not regulated as a hazardous material.

SECTION 15 - REGULATORY INFORMATION

European Labeling in Accordance with EC Directives
Hazard Symbols: Not Available
Risk Phrases
Not Available
Safety Phrases
Not Available

SECTION 16 - OTHER INFORMATION

The above information is believed to be correct on the date it is published and must not be considered all inclusive. The information has been obtained only by a search of available literature and is only a guide for handling the chemicals. OSHA regulations require that if other hazards become evident, an upgraded MSDS must be made avalible to the employee

within three months. RESPONSIBILITY for updates lies with the employer and not with [subcontractor]

Persons not specifically and properly trained should not handle this chemical or its container. This MSDS is provided without any warranty expressed or implied, including merchantability or fitness for any particular purpose.

This product is furnished FOR LABORATORY USE ONLY! Our products may NOT BE USED as drugs, cosmetics, agricultural or pesticidal products, food additives or as household chemicals.

BATTELLE MEMORIAL INSTITUTE
MATERIAL SAFETY DATA SHEET

Preparation Date: January 25, 2002

Manufacturer: Battelle Memorial Institute
505 King Avenue
Columbus, OH 43201

Emergency Contact:
Emergency Telephone Number: (614) 424-4444

SECTION I: Product Identification

Chemical Name: 2-hydroxyanthraquinone

SECTION II: Hazardous Ingredients

Description	Percent	CAS Registry No.	TLV
2-hydroxy-9, 10-anthracenedione	>95	605-32-3	None Established

SECTION III: Physical Data

Melting Point (°C)	194 – 195 ^{0} C	Specific Gravity (H_2O=1)	N/A
Vapor Pressure (mm Hg) @ 100°C	N/A	% Volatile by Volume	N/A
Vapor Density (Air=1)	N/A	Evaporation Rate (H_2O=1)	N/A
Solubility in Water	Not soluble	pH (Range)	N/A
Appearance	Yellow-green powder	Odor	N/A

N/A = Not Available

SECTION IV: Fire & Explosion Data

Flash Point: N/A

Flammable Limits: N/A
Special Firefighting Procedures: N/A
Unusual Fire & Explosion Hazards: N/A
Emergency First Aid Procedures: N/A

SECTION V: Reactivity Data

Stability: N/A
Hazardous Polymerization: Will not occur
Incompatibility (Materials to Avoid): Oxidizers
Hazardous Decomposition Products: N/A

SECTION VI: Spill or Leak Procedures

Steps to be taken in case material is released or spilled: Contain the material. Collect for proper disposal.

Dispose of material in accordance with Federal, State, and local regulations

SECTION VII: Personal Protective Equipment

When handling chemicals of unknown toxicity, it is recommended that personal protective equipment be worn.

SECTION VIII: Other Information

This material is intended for research purposes only.

SECTION IX: First Aid

Inhalation: First Aid - N/A

Skin Contact: First Aid - N/A

Eye Contact: First Aid - N/A

Ingestion: First Aid - N/A

SECTION X: Health Hazards

Potential Health Effects

Inhalation:	Short term effects - N/A Long term effects - N/A
Skin Contact:	Short term effects - N/A Long term effects - N/A
Eye Contact:	Short term effects - N/A Long term effects - N/A
Ingestion:	Short term effects - N/A Long term effects - N/A

Carcinogen Status:

OSHA - No
NTP - No
IARC - No

SECTION XI: Exposure

Exposure Limits: N/A

[subcontractor]

[ ]

MATERIAL SAFETY DATA SHEET

IDENTITY: 1-nitroanthracene
CAS NUMBER: N/A

SECTION I

Manufacturer: [ ]

Emergency Telephone Number: [ ]
Date Prepared: August 29, 2001

SECTION II - HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

Hazardous Components	OSHA PEL	ACGIH TLV	Other Limits	%
1-nitroanthracene	N/A	N/A	—	100

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point(degrees C): N/A

Specific Gravity (Water=1): N/A

Vapor Pressure (mmHg): N/A

Melting Point(degrees C): 117

Vapor Density (Air=1) N/A

Evaporation Rate (Butyl Acetate=1): N/A

Solubility in Water: Insoluble.

Appearance and Odor: Yellow solid.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: N/A
Method Used: Closed Cup

Flammable Limits
LEL: N/A UEL: N/A

Extinguishing Media: Dry chemical, carbon dioxide or Halon extinguisher.

Special Fire Fighting Procedures: N/A

Unusual Fire and Explosion Hazards: N/A

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[Subc. #]

[subcontractor address]

SECTION V - REACTIVITY DATA

Stability - Unstable:
Stable: X

Conditions to Avoid: Prolonged exposure to air and light. It darkens in sunlight.

Incompatible Materials: Oxidizers, flame, CA $(OCL)_2$, and chromic acid.

Hazardous Decomp Pdts: Toxic fumes of carbon monoxide and carbon dioxide.

Hazardous Polymerization - May Occur:
Will Not Occur: X

Conditions to Avoid: N/A

SECTION VI - HEALTH HAZARD DATA

Routes of Entry: Inhalation? Yes Skin? Yes Ingestion? Yes

Health Hazards: Exposure to 1-nitroanthracene may result in irritation.

Carcinogenicity: NTP? N/A IARC? N/A OSHA? N/A

Symptoms of Exposure: Exposure to 1-nitroanthracene may cause irritation of the eyes and respiratory tract. If swallowed, it may cause gastric irritation. Long-term contact may result in pigmentation or cancer of the skin.

Medical Conditions Aggravated by Exposure: N/A

Emergency and First Aid Procedures: If ingested, give victim large quantities of liquid and transport to a medical facility. In case of external exposure, wash affected areas with large amounts of water and transport to a medical facility. If breathing is disturbed, give artificial respiration while transporting to a medical facility.

SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material is Released or Spilled: Remove all sources of ignition. Use absorbent paper to pick up all spilled material. If necessary, soak absorbent paper in an appropriate solvent such as toluene or alcohol to pick up remaining traces.

Waste Disposal Method: Waste materials should be disposed of under conditions which meet Federal, State, and Local environmental control regulations.

Precautions to be Taken in Handling and Storing: Refrigerate.
Protect from light.

Other Precautions: N/A

SECTION VIII - CONTROL MEASURES

Respiratory Protection: Avoid inhalation of vapors. Cartridge type respirator with organic vapor cartridges recommended.

Ventilation -Local Exhaust: Handle in an efficient fume hood or glove box.
General Mechanical: Normal laboratory air exchange.
Special: N/A

Protective Gloves: Use two dissimilar types. PVC or Neoprene over latex.

Other Protective Clothing or Equipment: Lab coat or Tyvek® suit recommended.

Work/Hygienic Practices: Only experienced personnel should be allowed to handle this material.

[Duke #]

[Subcontractor]

[ ]

MATERIAL SAFETY DATA SHEET

IDENTITY: 1-Nitroanthracene
CAS NUMBER: N/A

SECTION I

Manufacturer: [ ]

Emergency Telephone Number: [ ]
Date Prepared: November 29, 2001

SECTION II - HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

Hazardous Components	OSHA PEL	ACGIH TLV	Other Limits	%
1-Nitroanthracene	N/A	N/A	—	100

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point (degrees C): N/A
Specific Gravity (Water=1): N/A
Vapor Pressure (mm Hg): N/A
Melting Point (degrees C): 114-117
Vapor Density (Air=1): N/A
Evaporation Rate (Butyl Acetate=1): N/A
Solubility in Water: Insoluble.
Appearance and Odor: Yellow-orange solid.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: N/A
Method Used: N/A
Flammable Limits LEL: N/A UEL: N/A
Extinguishing Media: Dry chemical, carbon dioxide or Halon extinguisher.
Special Fire Fighting Procedures: N/A
Unusual Fire and Explosion Hazards: N/A

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[subcontractor address]

[Page #]

SECTION V - REACTIVITY DATA

Stability - Unstable:
Stable: X

Conditions to Avoid: Prolonged exposure to air and light. It darkens in sunlight.

Incompatible Materials: Oxidizers, flame, $Ca(OCL)_2$, and chromic acid.

Hazardous Decmp Pdts: Toxic fumes of carbon monoxide and carbon dioxide.

Hazardous Polymerization - May Occur: Conditions to Avoid: N/A
Will Not Occur: X

SECTION VI - HEALTH HAZARD DATA

Routes of Entry: Inhalation? Yes Skin? Yes Ingestion? Yes

Health Hazards: Exposure to 1-Nitroanthracene may result in irritation.

Carcinogenicity: NTP? N/A IARC? N/A OSHA? N/A

Symptoms of Exposure: Exposure to 1-Nitroanthracene may cause irritation of the eyes and respiratory tract. If swallowed, it may cause gastric irritation. Long-term contact may result in pigmentation or cancer of the skin.

Medical Conditions Aggravated by Exposure: N/A

Emergency and First Aid Procedures: If ingested, give victim large quantities of liquid and transport to a medical facility. In case of external exposure, wash affected areas with large amounts of water and transport to a medical facility. If breathing is disturbed, give artificial respiration while transporting to a medical facility.

SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be taken in Case Material is Released or Spilled: Remove all sources of ignition. Use absorbent paper to pick up all spilled material. If necessary, soak absorbent paper in an appropriate solvent such as toluene or alcohol to pick up remaining traces.

Waste Disposal Method: Waste materials should be disposed of under conditions which meet Federal, State, and Local environmental control regulations.

Precautions to be taken in Handling and Storing: Refrigerate.
Protect from light.

Other Precautions: N/A

SECTION VIII - CONTROL MEASURES

Respiratory Protection: Avoid inhalation of vapors. Cartridge type respirator with organic vapor cartridges recommended.

Ventilation -Local Exhaust: Handle in an efficient fume hood or glove box.
General Mechanical: Normal laboratory air exchange.
Special: N/A

Protective Gloves: Use two dissimilar types. PVC or Neoprene over latex.

Other Protective Clothing or Equipment: Lab coat or Tyvek® suit recommended.

Work/Hygienic Practices: Only experienced personnel should be allowed to handle this material.

[Subc. #]

[subcontractor]

[ ]

MATERIAL SAFETY DATA SHEET

IDENTITY: 2-nitroanthracene
CAS NUMBER: N/A

SECTION I

Manufacturer: [ ]

Emergency Telephone Number: [ ]
Date Prepared: April 10, 2001

SECTION II - HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

Hazardous Components	OSHA PEL	ACGIH TLV	Other Limits	%
2-nitroanthracene	N/A	N/A	—	100

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point(degrees C): N/A
Specific Gravity (Water=1): N/A
Vapor Pressure (mmHg): N/A
Melting Point(degrees C): 181-182
Vapor Density (Air=1) N/A
Evaporation Rate (Butyl Acetate=1): N/A
Solubility in Water: Insoluble.
Appearance and Odor: Yellow solid.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: N/A
Method Used: Closed Cup
Flammable Limits LEL: N/A UEL: N/A
Extinguishing Media: Dry chemical, carbon dioxide or Halon extinguisher.
Special Fire Fighting Procedures: N/A
Unusual Fire and Explosion Hazards: N/A

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(Subc. #)

[subcontractor address]

SECTION V - REACTIVITY DATA

Stability - Unstable:
Stable: X

Conditions to Avoid: Prolonged exposure to air and light. It darkens in sunlight.

Incompatible Materials: Oxidizers, flame, CA $(OCL)_2$, and chromic acid.

Hazardous Decmp Pdts: Toxic fumes of carbon monoxide and carbon dioxide.

Hazardous Polymerization - May Occur:
Will Not Occur: X

Conditions to Avoid: N/A

SECTION VI - HEALTH HAZARD DATA

Routes of Entry: Inhalation? Yes Skin? Yes Ingestion? Yes

Health Hazards: Exposure to 2-nitroanthracene may result in irritation.

Carcinogenicity: NTP? N/A IARC? N/A OSHA? N/A

Symptoms of Exposure: Exposure to 2-nitroanthracene may cause irritation of the eyes and respiratory tract. If swallowed, it may cause gastric irritation. Long-term contact may result in pigmentation or cancer of the skin.

Medical Conditions Aggravated by Exposure: N/A

Emergency and First Aid Procedures: If ingested, give victim large quantities of liquid and transport to a medical facility. In case of external exposure, wash affected areas with large amounts of water and transport to a medical facility. If breathing is disturbed, give artificial respiration while transporting to a medical facility.

SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material is Released or Spilled: Remove all sources of ignition. Use absorbent paper to pick up all spilled material. If necessary, soak absorbent paper in an appropriate solvent such as toluene or alcohol to pick up remaining traces.

Waste Disposal Method: Waste materials should be disposed of under conditions which meet Federal, State, and Local environmental control regulations.

Precautions to be Taken in Handling and Storing: Refrigerate.
Protect from light.

Other Precautions: N/A

SECTION VIII - CONTROL MEASURES

Respiratory Protection: Avoid inhalation of vapors. Cartridge type respirator with organic vapor cartridges recommended.

Ventilation -Local Exhaust: Handle in an efficient fume hood or glove box.
General Mechanical: Normal laboratory air exchange.
Special: N/A

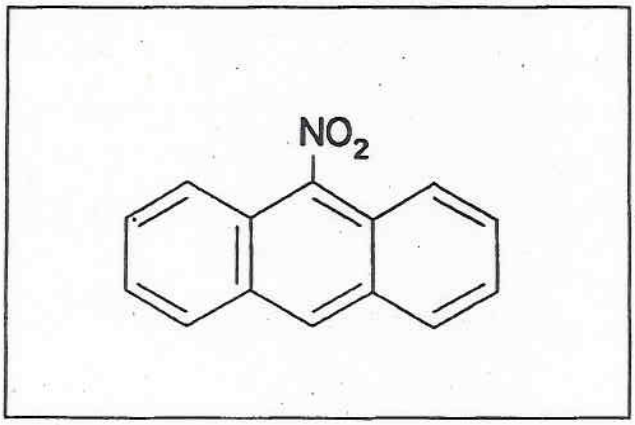
Protective Gloves: Use two dissimilar types. PVC or Neoprene over latex.

Other Protective Clothing or Equipment: Lab coat or Tyvek® suit recommended.

Work/Hygienic Practices: Only experienced personnel should be allowed to handle this material.

[Table # 2]

Product #: N10209 Name: 9-NITROANTHRACENE, 97%
Material Safety Data Sheet, Valid Dates 8/2000-10/2000
Printed 10/11/2000 13:07
Page 1



[Subcontractor]

[ ]

SECTION 1. - - - - - - - - - - CHEMICAL IDENTIFICATION- - - - - - - - - -
CATALOG #: N10209
NAME: 9-NITROANTHRACENE, 97%
SECTION 2. - - - - - COMPOSITION/INFORMATION ON INGREDIENTS - - - - - -
CAS #: 602-60-8
MF: C14H9NO2
EC NO: 210-021-9
SYNONYMS
5-NITROANTHRACENE * 9-NITROANTHRACENE *
SECTION 3. - - - - - - - - - - HAZARDS IDENTIFICATION - - - - - - - - -
DATA NOT AVAILABLE
SECTION 4. - - - - - - - - - - FIRST-AID MEASURES- - - - - - - - - -
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES.
IN CASE OF CONTACT, IMMEDIATELY WASH SKIN WITH SOAP AND COPIOUS AMOUNTS OF WATER.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IF SWALLOWED, WASH OUT MOUTH WITH WATER PROVIDED PERSON IS CONSCIOUS. CALL A PHYSICIAN.
WASH CONTAMINATED CLOTHING BEFORE REUSE.
SECTION 5. - - - - - - - - - - FIRE FIGHTING MEASURES - - - - - - - - - -
EXTINGUISHING MEDIA
WATER SPRAY.
CARBON DIOXIDE, DRY CHEMICAL POWDER OR APPROPRIATE FOAM.
SPECIAL FIREFIGHTING PROCEDURES
WEAR SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING TO PREVENT CONTACT WITH SKIN AND EYES.
UNUSUAL FIRE AND EXPLOSIONS HAZARDS

EMITS TOXIC FUMES UNDER FIRE CONDITIONS.

SECTION 6. - - - - - - - - - ACCIDENTAL RELEASE MEASURES- - - - - - - - -

WEAR RESPIRATOR, CHEMICAL SAFETY GOGGLES, RUBBER BOOTS AND HEAVY RUBBER GLOVES.
SWEEP UP, PLACE IN A BAG AND HOLD FOR WASTE DISPOSAL.
AVOID RAISING DUST.
VENTILATE AREA AND WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.

SECTION 7. - - - - - - - - - - HANDLING AND STORAGE- - - - - - - - - - -

REFER TO SECTION 8.

SECTION 8. - - - - - - EXPOSURE CONTROLS/PERSONAL PROTECTION- - - - - -

CHEMICAL SAFETY GOGGLES.
COMPATIBLE CHEMICAL-RESISTANT GLOVES.
NIOSH/MSHA-APPROVED RESPIRATOR.
SAFETY SHOWER AND EYE BATH.
MECHANICAL EXHAUST REQUIRED.
AVOID INHALATION.
AVOID CONTACT WITH EYES, SKIN AND CLOTHING.
AVOID PROLONGED OR REPEATED EXPOSURE.
WASH THOROUGHLY AFTER HANDLING.
KEEP TIGHTLY CLOSED.
STORE IN A COOL DRY PLACE.

SECTION 9. - - - - - - - - PHYSICAL AND CHEMICAL PROPERTIES - - - - - - - -

APPEARANCE AND ODOR
YELLOW CRYSTALLINE POWDER
PHYSICAL PROPERTIES
MELTING POINT: 144 C TO 146 C

SECTION 10. - - - - - - - - - -STABILITY AND REACTIVITY - - - - - - - - - -

INCOMPATIBILITIES
STRONG OXIDIZING AGENTS
STRONG BASES
HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS
TOXIC FUMES OF:
CARBON MONOXIDE, CARBON DIOXIDE
NITROGEN OXIDES

SECTION 11. - - - - - - - - - TOXICOLOGICAL INFORMATION - - - - - - - - -

ACUTE EFFECTS
MAY BE HARMFUL BY INHALATION, INGESTION, OR SKIN ABSORPTION.
MAY CAUSE EYE IRRITATION.
MAY CAUSE SKIN IRRITATION.
TO THE BEST OF OUR KNOWLEDGE, THE CHEMICAL, PHYSICAL, AND TOXICOLOGICAL PROPERTIES HAVE NOT BEEN THOROUGHLY INVESTIGATED.
RTECS #: CB0715000
ANTHRACENE, 9-NITRO-
ONLY SELECTED REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES (RTECS) DATA IS PRESENTED HERE. SEE ACTUAL ENTRY IN RTECS FOR COMPLETE INFORMATION.

SECTION 12. - - - - - - - - - - ECOLOGICAL INFORMATION - - - - - - - - - -

DATA NOT YET AVAILABLE.

SECTION 13. - - - - - - - - - - DISPOSAL CONSIDERATIONS - - - - - - - - - -

DISSOLVE OR MIX THE MATERIAL WITH A COMBUSTIBLE SOLVENT AND BURN IN A CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER AND SCRUBBER.
OBSERVE ALL FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS.

SECTION 14. - - - - - - - - - - TRANSPORT INFORMATION - - - - - - - - - -

CONTACT ALDRICH CHEMICAL COMPANY FOR TRANSPORTATION INFORMATION.

SECTION 15. - - - - - - - - - - REGULATORY INFORMATION - - - - - - - - - -

REVIEWS, STANDARDS, AND REGULATIONS
OEL-MAK
IARC CANCER REVIEW:ANIMAL NO ADEQUATE DATA IMEMDT 33,179,1984
IARC CANCER REVIEW:HUMAN NO ADEQUATE DATA IMEMDT 33,179,1984

Product #: N10209 Name: 9-NITROANTHRACENE, 97%
Material Safety Data Sheet, Valid Dates 8/2000-10/2000
Printed 10/11/2000 13:07
Page 3

IARC CANCER REVIEW:GROUP 3 IMSUDL 7,56,1987

SECTION 16. - - - - - - - - - - - OTHER INFORMATION- - - - - - - - - - - -

THE ABOVE INFORMATION IS BELIEVED TO BE CORRECT BUT DOES NOT PURPORT TO BE ALL INCLUSIVE AND SHALL BE USED ONLY AS A GUIDE. SIGMA, ALDRICH, FLUKA SHALL NOT BE HELD LIABLE FOR ANY DAMAGE RESULTING FROM HANDLING OR FROM CONTACT WITH THE ABOVE PRODUCT. SEE REVERSE SIDE OF INVOICE OR PACKING SLIP FOR ADDITIONAL TERMS AND CONDITIONS OF SALE.