

The
Condensed Chemical
Dictionary

NINTH EDITION

Revised by

GESSNER G. HAWLEY

R
54.072
C 745(9)

The
Condensed Chemical
Dictionary

NINTH EDITION

Revised by

GESSNER G. HAWLEY

Coeditor, Encyclopedia of Chemistry
Coauthor, Glossary of Chemical Terms

36067/20



VAN NOSTRAND REINHOLD COMPANY

NEW YORK

CINCINNATI
LONDON

ATLANTA
TORONTO

DALLAS

SAN FRANCISCO

MELBOURNE



Van Nostrand Reinhold Company Regional Offices:
New York Cincinnati Atlanta Dallas San Francisco

Van Nostrand Reinhold Company International Offices:
London Toronto Melbourne

Copyright © 1977 by Litton Educational Publishing, Inc.

Library of Congress Catalog Card Number: 76-19024
ISBN: 0-442-23240-3

All rights reserved. Certain portions of this work copyright © 1930, 1920, 1919 by The Chemical Catalog Co., Inc. and 1971, 1966, 1956, 1950 by Litton Educational Publishing, Inc. No part of this work covered by the copyright hereon may be reproduced or used in any form or by any means—graphic, electronic, or mechanical, including photocopying, recording, taping, or information storage and retrieval systems—without permission of the publisher.

Manufactured in the United States of America

Published by Van Nostrand Reinhold Company
135 West 50th Street, New York, N.Y. 10020

Published simultaneously in Canada by Van Nostrand Reinhold Ltd.

15 14 13 12 11 10 9 8 7

Library of Congress Cataloging in Publication Data
Main entry under title:

The Condensed chemical dictionary.

I. Chemistry--Dictionaries. I. Hawley, Gessner
Goodrich. 1905--
QD5.C5 1976 540.3 76-19024
ISBN 0-442-23240-3

The
Condensed Chemical
Dictionary



Publisher's Preface

With the appearance of the Ninth Edition, "The Condensed Chemical Dictionary" rounds out half a century of continuous service to the chemical and process industries, and to the many thousands of people throughout the world whose work and interests have brought them into contact with chemistry and its commercial products. The First Edition appeared in 1919, when the chemical industry in the United States was just entering on a huge expansion program as a result of World War I. At that time, the urgent need for such a reference book became apparent to Francis M. Turner, then Vice-President of the Chemical Catalog Company, predecessor of Reinhold Publishing Corporation. He remained

Editorial Director of the Dictionary until his death.

The Second and Third Editions were prepared with the assistance of Thomas C. Gregory. The Fourth and following three editions underwent considerable expansion under the capable editorship of Professor and Mrs. Arthur Rose, of State College, Pennsylvania; their competent and effective work improved the Dictionary in many ways. The Eighth Edition was published in 1971, and the Publishers entertain the hope that the Ninth Edition will be equally well received.

VAN NOSTRAND REINHOLD COMPANY

Introduction

The first edition of the *Condensed Chemical Dictionary* appeared in 1919, when the chemical industry in the United States was entering on a huge expansion program as a result of World War I. The urgent need for such a reference book became apparent to Francis M. Turner, President of the Chemical Catalog Company, predecessor of the Reinhold Publishing Corporation. Under his supervision a succession of Editors developed and expanded the *Condensed Chemical Dictionary* to meet the growing needs of the chemical industries. Since his death this development has continued, with the result that the work has achieved world-wide recognition in its field.

The *Condensed Chemical Dictionary* is a unique publication. It is not a dictionary in the usual sense of an assemblage of brief definitions, but rather a compendium of technical data and descriptive information covering many thousand chemicals and chemical phenomena, organized in such a way as to meet the needs of those who have only minutes to devote to any given substance or topic.*

Three distinct types of information are presented: (1) technical descriptions of chemicals, raw materials, and processes; (2) expanded definitions of chemical entities, phenomena, and terminology; and (3) description or identification of a wide range of trademarked products used in the chemical industries. Supplementing these are listings of accepted chemical abbreviations used in the literature, short biographies of chemists of historic importance, and descriptions or notations of the nature and location of many American technical societies and trade associations. In special cases editorial notes have been supplied where it was felt necessary to clarify or amplify a definition or description. A few entries written by specialists are acknowledged by use of the author's name.

In a work of this nature, selection of topics for inclusion can hardly fail to be influenced by

current interests and developing concerns within the topic area. The growing importance to chemists—and to the general public as well—of environmental and health hazards, which came to the forefront so quickly in the 1960's, was reflected in the Eighth Edition, which greatly increased its coverage of this aspect of chemistry. Now, nearly ten years later, the magnitude of the energy problem has been uppermost in the thinking of a broad spectrum of engineers, chemists, and physicists, since it is certainly the No. 1 technical problem confronting this country. Thus the present edition, while retaining its emphasis on environmental considerations, has been expanded in the area of energy and its sources, as far as permitted by presently available information. The effort has been to provide condensed, authoritative, factually oriented statements and descriptions, and to resist prognostications as to the future potential of any particular energy source. At the same time, continuing attention has been devoted to common hazards, such as flammable and explosive materials, poisons, pesticides, carcinogens, corrosive agents, etc., in line with the practice followed in earlier editions, and with the increasing public concern over these matters.

In connection with certain classifications of substances, particularly pesticides and carcinogens, which have occasioned the most controversy in recent years, the statement "Use may be restricted" indicates that a state or local regulation may exist even though the product has not been officially banned, or that a definitive ruling on its use is pending. A number of disputed cases have arisen recently; though some have been definitely settled, others are still being evaluated or are in the process of litigation. Typical is the instance of diethylstilbestrol (DES), use of which in cattle feeds for rapid fattening was first prohibited, later conditionally approved, and finally once again prohibited. Where a spe-

*More detailed and sophisticated treatment is presented in the *Encyclopedia of Chemistry*, Third Edition, edited by C. H. Hampel and G. G. Hawley (Van Nostrand Reinhold, 1973). An elementary volume designed primarily for student use, entitled *Glossary of Chemical Terms*, by the same authors and publisher, is also available (1976).

cific ruling has been made by a Federal agency limiting the use of a product to certain purposes, this is indicated by the statement "Use has been restricted," e.g., for DDT. When a product has been banned outright, the statement "Use has been prohibited" is used. In such a work as this, in view of the many materials in various stages of evaluative testing, court procedures, appeals, hearings, etc., it is impossible to keep abreast of every development. The user should check the current status of any questionable products before making decisions that involve them. (See also paragraph on Hazards, below.)

Arrangement of Entries

The entries are listed in strict alphabetical order; that is, those comprised of two or more words are alphabetized as if they were a single word, e.g., "acidimetry" precedes "acid value," and "waterproofing agent" precedes "water softener." The many prefixes used in organic chemistry are disregarded in alphabetizing, since they are not considered an integral part of the name; these include ortho-, meta-, para-, alpha, beta-, gamma-, sec-, tert-, sym-, as-, uns-, cis-, trans-, endo-, exo-, d-, l-l, dl-, n-, N-, O-, as well as all numerals denoting structure. However, there are certain prefixes that are an integral part of the name (iso-, di-, tri-, tetra-, cyclo-, bis-, neo-, pseudo-), and in these cases the name is placed in its normal alphabetical position, e.g., dimethylamine under D and isobutane under I. The same is true of mono- (used as little as possible) and of ortho-, meta-, and para- in inorganic compounds such as sodium orthophosphate.

Chemicals and Raw Materials

The information in the categories listed below is given for each substance in the sequence indicated; where entries are incomplete, it may be presumed that no reliable data were provided by the reference systems utilized.

Name: The commonly accepted name is the key entry. Terminological variations are indicated where necessary. In virtually all cases, the name is given in the singular number. A name having initial caps and enclosed in quotes is a trademark; the superior numbers refer to the name of the manufacturer given in Appendix I.

Synonym: Alternate names (IUPAC and others), as well as trivial names, are indicated. Obsolete and slang names have been eliminated as far as possible. Most synonyms are entered independently and cross-referenced, but space limitation has not permitted complete consistency in this regard.

Formula: The molecular (or atomic) formula is regularly given; structural formulas are used in special cases of unusual importance or interest.

Properties: The properties typically given are: physical state; atomic number; atomic weight; valence; isotopes; odor; taste; specific gravity; boiling point (at 760 mm Hg unless otherwise stated); melting point (freezing point); refractive index; solubility; or miscibility. Various other properties are given where pertinent: flash point; autoignition point; electrical properties; tensile strength; hardness; or expansion coefficient.

Source or Occurrence: Geographical origin of metals, ores, essential oils, vegetable oils, and other natural products.

Derivation: The chemical reactions or other means of obtaining the product; current industrial methods are emphasized; obsolete and "curiosity" methods have been largely eliminated.

Grades: Recognized grades as reported in the industrial literature, including technical, C.P., U.S.P., refined, reactor, semiconductor, and the like.

Containers: Unit types; tank cars; tank trucks; carlots; bulk; barges; pipelines.

Hazard: This category includes flammability, toxicity, tissue irritation, explosion risks, etc., based on authoritative data. Also given are the tolerance ratings (Threshold Limit Values) for workroom exposures established by the American Conference of Government Industrial Hygienists; various rulings of the Food and Drug Administration; as well as reference to chemical safety data sheets prepared by and available from the Manufacturing Chemists Association, 1825 Connecticut Ave., N.W., Washington, D.C., 20009. It was not considered practicable

to include exposure standards established by the Federal regulatory bodies NIOSH and OSHA; those that have been determined have been published periodically in the *Federal Register* over the last few years.

The toxicity ratings are intended to be used only as indications of the industrial hazard presented by a given material; qualified toxicologists or physicians should be consulted for specific evaluations, dosages, exposure times and concentrations. For further information regarding these hazards, the reader is referred to the following entries: combustible material; flammable material; dust, industrial; corrosive material; oxidizing material; poison (1); toxicity; toxic materials; carcinogen.

Uses: These are primarily large-scale applications. Because of the rapidity of change in the chemical industries and the difficulty of obtaining reliable current data, no attempt has been made to list uses in the order of their tonnage consumption. The patent literature is not specifically represented.

Shipping Regulations: The requirements for transportation labelling for both rail and air are given under this heading; they are based on those established by the official regulatory agencies at the time this book was in preparation. These agencies are the Department of Transportation (Graziano's Tariff No. 25), Washington, D.C., for rail and water transport, and the Federal Aviation Authority, which observes the regulations of the International Air Transport Association, Geneva, Switzerland (P.O. Box 160). These schedules are periodically updated—indeed the latter issues a revised tariff annually.

In view of the frequent and numerous changes in labelling specifications, the designations "Rail" and "Air" are used in the Shipping Regulations entry, rather than the initials of the agencies (DOT and IATA), as in previous editions. This has been done to avoid the impression that such regulations are currently definitive. It should not be assumed that any given label specification in this book is ipso facto the latest ruling of either agency. For this reason, **this Dictionary is not to be cited as a final authority for any transportation label.** All

manufacturers and shippers should obtain the official revised tariffs on a regular basis to ensure proper compliance, not only in respect to labeling but to the many other shipping specifications for hazardous materials contained therein.

General Entries

It is likely that no two editors would completely agree about what general subjects should be included in a dictionary of this kind. The major subdivisions of matter directly involved with chemical reactions, the various states of matter, and the more important groups of compounds would almost certainly be regarded as essential; but beyond these, the area of selectivity widens rapidly. The topics either added or expanded by the present Editor were chosen chiefly because of their interest and importance, both industrial and biochemical, and secondarily because of the terminological confusion evidenced in the literature and in industrial practice. Regarding the latter, the reader is referred to the entries on gum, resin, pigment, dye, filler, extender, reinforcing agent, homogeneous, and combustible materials. In some cases a position has been taken which may not be accepted by all, but which is defensible and certainly not arbitrary. Even editors must acknowledge that the meanings and uses of terms often change illogically, and that such changes are usually irreversible.

Among the general entries are: important subdivisions of chemistry; short biographies of outstanding chemists of the past; numerous group definitions (barbiturate, peroxide); major chemical and physicochemical phenomena (polymerization, catalysis); functional names (anti-freeze, heat-exchange agent, sequestrant); terms describing special material forms (aerosol, foam, fiber); energy sources (solar cell, fuel cell, fusion); and the more important chemical processes. No general entry is intended to be encyclopedic or definitive, but rather a condensation of essential information, to be supplemented by reference to specialized sources. To present all this in useful and acceptably complete form has been a challenging, though often frustrating task, which the Editor leaves with the uneasy feeling that, like the breadcrumbs in the Mad Hatter's butter, some mistakes may have got in as well.

Trademarks

Continuing the policy of previous editions, an essential component of the Dictionary comprises descriptions of several thousand proprietary industrial products. The information was either provided by the manufacturers of these materials or taken from announcements or advertisements appearing in the technical press. Each proprietary name is enclosed in quotation marks, is stated to be a trademark (or brand name), and is followed by a superscript number referring to the Numerical List of Manufacturers on page 948. From this, the address of the manufacturer can easily be found in the Alphabetical List of Manufacturers. We wish to thank the owners of these trademarks for making the information available. The space devoted to these is necessarily limited, as the constant proliferation of trademarked products makes it impossible to list more than a small fraction of them in a volume such as this.

The absence of a specific trademark designation does not mean that proprietary rights may not exist in a particular name. No listing, de-

scription, or designation in this book is to be construed as affecting the scope, validity, or ownership of any trademark rights that may exist therein. Neither the Editor nor the Publisher assumes any responsibility for the accuracy of any such description, or for the validity or ownership of any trademark.

A Request

Many corrections and suggestions have been received from readers during the long history of the earlier editions; the Editors have always tried to acknowledge these to the best of their ability, and they have welcomed this correspondence, for it has been an important source of information about the acceptance of the Dictionary by its market. The present Editor and Publisher wish to encourage this reaction from the field, not only to permit corrections to be made in reprinted issues, but also as a basis for preparing future editions. All letters addressed to the Publisher will be forwarded.

THE EDITOR

Abbreviations

ACS	American Chemical Society (q.v.)	g	gram
ASTM	American Society for Testing and Materials (q.v.)	gal	gallon
b.p.	boiling point	lb	pound
°C	degrees centigrade (Celsius)	ml	milliliter
cc	cubic centimeter	m.p.	melting point
C.P.	chemically pure; a grade designation signifying a minimum of impurities, but not 100% purity.	MCA	Manufacturing Chemists Association (q.v.)
CNS	central nervous system	mg	milligram
C.C.	closed cup	mm	millimeter
COC	Cleveland Open Cup	N.D.	"New Drugs" (an annual publication).
C.I.	"Colour Index" (a standard British publication giving official numerical designations to colorants).	N.F.	"National Formulary" (a publication).
cp	centipoise	O.C.	Open Cup
cu	cubic	ppm	parts per million
°F	degrees Fahrenheit	psi(a)	pounds per square inch (absolute)
FCC	"Food Chemicals Codex," First Edition and supplements. Published by National Research Council, Washington, D.C. Second Edition available 1972.	q.v.	quod vide (which see)
FDA	Food and Drug Administration, the Federal agency responsible for enforcing the Food, Drug, and Cosmetic Act. It also has authority to establish tolerances for pesticides on food products, to regulate food additives, including colors, and to require proof of the efficacy and safety of drugs. In recent years its authority has been extended to cover flammable products, dangerous chemicals, packaging and labeling.	sec.	second
f.p.	freezing point	sp. gr.	specific gravity
FTC	Federal Trade Commission (a consumer protection agency).	TCC	Tagliabue Closed Cup
		TOC	Tagliabue Open Cup
		USAN	United States Adopted Name: a non-proprietary name approved by the American Pharmaceutical Association, American Medical Association, and the U.S. Pharmacopeia. Such names applied to pharmaceutical products do not imply endorsement; their use in advertising and labeling is required by law.
		USDA	U.S. Department of Agriculture.
		U.S.P.	United States Pharmacopeia: a standard publication of authorized drugs and materia medica, now in its 18th edition. Published by Mack Publishing Co., Easton, Pa.
		wt/gal	weight per gallon

Contents

PUBLISHER'S PREFACE	vii
INTRODUCTION	ix
ABBREVIATIONS	xiii
CONDENSED CHEMICAL DICTIONARY	1
APPENDIX I: MANUFACTURERS OF TRADEMARKED PRODUCTS (NUMERICAL LIST)	948
APPENDIX II: MANUFACTURERS OF TRADEMARKED PRODUCTS (ALPHABETICAL LIST)	952

61936

A

A (1) Abbreviation for absolute temperature; (2) abbreviation for Angstrom (q.v.); (3) symbol for mass number (AEC).

abaca (Manila hemp). The strongest vegetable fiber, obtained from the leaves of a tree of the banana family. The fibers are 4-8 ft long, light in weight, soft, lustrous, nearly white, and do not swell or lose strength when wet. Denier ranges from 300 to 500. Combustible, but self-extinguishing.

Sources: Philippines, Central America, Sumatra.

Grades: Available in 18 grades based on color and length.

Uses: Heavy cordage and twine, especially for marine use; manila paper.

See also hemp.

ABC salt. Abbreviation for 4',4'' azobis-4-biphenyl-carboxylic acid, disodium salt used as a chemical intermediate.

abherent. Any substance that prevents adhesion of a material to itself or to another material. It may be in the form of a dry powder (talc, starch); a suspension (bentonite-water); a solution (soap-water); or a soft solid (stearic acid, tallow). Abherents are used as dusting agents and mold washes in the adhesives, rubber and plastics industries. Fats and oils are used as abherents in the baking industry. Fluorocarbon-resin coatings on metals are widely used on cooking utensils.

Abies Siberica oil. See fir needle oil.

abietic acid (abietinic acid; sylvic acid) $C_{19}H_{29}COOH$ (having a phenanthrene ring system). A major active ingredient of rosin, where it occurs with other resin acids. The term is often applied to these mixtures, separation of which is not achieved in technical grade material.

Properties: Yellowish resinous powder; m.p. 172-175°C; optical rotation -106° ; soluble in alcohol, ether, chloroform, and benzene; insoluble in water. Combustible. Low toxicity.

Derivation: Rosin, pine resin; tall oil.

Method of purification: Crystallization.

Grades: Technical.

Containers: Kegs; drums; multiwall paper bags.

Uses: Abietates (resinates) of heavy metals as varnish driers; esters in lacquers and varnishes; fermentation industries; soaps.

"Abitol."²⁶⁶ Trademark for a colorless, tacky, very viscous liquid; mixture of tetra-, di-, and dehydroabietyl alcohols made from rosin.

Uses: Plasticizers, tackifiers, adhesive modifiers.

ablation. The rapid removal of heat (5000 to 10,000°F) from a metallic substrate by pyrolysis of a material of low thermal conductivity, which is able to absorb or dissipate the heat while being decomposed to gases and porous char. Ablative materials applied to the exterior of temperature-sensitive structures isolate them from hyperthermal effects of the environment.

Interaction of a high-energy environment with the exposed ablative material results in a small amount of sacrificial erosion of the surface material. The attendant energy-absorption processes control the surface temperature and greatly restrict the flow of heat into the substrate. Ablative materials are usually composed of a ceramic or glass-reinforced plastic.

abrasive. A finely divided, hard, refractory material, ranging from 6 to 10 on the Mohs scale, used to reduce, smooth, clean, or polish the surfaces of other, less hard substances, such as glass, plastic, stone, wood, etc. Natural abrasive materials include diamond dust, garnet, sand (silica), corundum (aluminum oxide, emery), pumice, rouge (iron oxide), and feldspar; the more important synthetic types are silicon carbide, boron carbide, cerium oxide, and fused alumina. Abrasives in powder form are used in several ways: (1) applied directly to the surface to be treated by mechanical pressure or compressed-air blast, as in cleaning building stone; (2) affixed to a paper or textile backing after the particles have been coated with an adhesive; or (3) mixed with a bonding agent such as sodium silicate or clay, the particles being compressed into a wheel rotated by a power-driven shaft.

abrasive, coated. See abrasive (2).

ABS. Abbreviation for (1) alkyl benzene sulfonate (detergent); (2) acrylonitrile-butadiene-styrene copolymer. See ABS resin.

"Absafil."²⁵⁹ Trademark for an acrylonitrile-butadiene-styrene copolymer reinforced with glass fiber. See also reinforced plastic.

abscisin. A plant hormone which promotes the aging process in plants, by inducing the dropping of leaves and fruit. Occurs naturally in many plants; the synthetic product is commercially available as abscisic acid. See also plant growth regulator.

absolute. (1) Free from admixture of other substances; pure. Example: absolute alcohol is dehydrated ethyl alcohol, 99% pure.

(2) The pure essential oil obtained by double solvent extraction of flowers in the manufacture of perfumes. See concrete (2).

(3) Absolute temperature (q.v.).

absolute temperature. The fundamental temperature scale used in theoretical physics and chemistry, and in certain engineering calculations such as the change in volume of a gas with temperature. Absolute temperatures are expressed either in degrees Kelvin or in degrees Rankine, corresponding respectively to the centigrade and Fahrenheit scales. Degrees Kelvin are obtained by adding 273 to the centigrade temperature, while degrees Rankine are obtained by adding 460 to the Fahrenheit temperature. The nearest practical approach to absolute zero is about -272°C .

Superior numbers refer to Manufacturers of Trade Mark Products. For page number see Contents.

absorbent. (1) Any substance exhibiting the property of absorption, e.g., absorbent cotton, so made by removal of the natural waxes present. See absorption (1). (2) A material that does not transmit certain wavelengths of incident radiation. See absorption (2).

absorption. (1) In chemical terminology, the penetration of one substance into the inner structure of another, as distinguished from adsorption, in which one substance is attracted to and held on the surface of another. Physicochemical absorption occurs between a liquid and a gas or vapor, as in the operation known as scrubbing (q.v.) in which the liquid is called an absorption oil; sulfuric acid, glycerol, and some other liquids absorb water vapor from the air under certain conditions. Physiological absorption takes place through porous tissues such as the skin and intestinal walls, which permit passage of liquids and gases into the bloodstream. See also adsorption; hygroscopic.

(2) In physical terminology, retention by a substance of certain wavelengths of radiation incident upon it, followed by either an increase in temperature of the substance or by a compensatory change in the energy state of its molecules. The ultraviolet component of sunlight is absorbed as the light passes through glass and some organic compounds, the radiant energy being transformed into thermal energy. The radiation-absorptive capacity of matter is utilized in analytical chemistry in various types of absorption spectroscopy (q.v.).

(3) In physical chemistry, the ability of some elements to pick up or "capture" thermal neutrons produced in nuclear reactors as a result of fission. This is due to the large capture cross section of their atoms, which is measured in units called barns; elements of particularly high neutron absorption capability are cadmium and boron.

absorption band. The range of wavelengths absorbed by a molecule; for example, absorption in the infrared band of 2.3 to 3.2 μ indicates the presence of OH and NH groups, while the 3.3 to 3.5 band indicates aliphatic structure. Atoms absorb only a single wavelength, producing lines, such as the sodium D line. See also spectroscopy; resonance (2); ultraviolet absorber; excited state.

absorption oil. See absorption (1).

absorption spectroscopy. An important technique of instrumental analysis involving measurement of the absorption of radiant energy by a substance as a function of the energy incident upon it. Absorption processes occur throughout the electromagnetic spectrum, ranging from the gamma region (nuclear resonance absorption or the Mossbauer effect) to the radio region (nuclear magnetic resonance). In practice they are limited to those processes that are followed by the emission of radiant energy of greater intensity than that which was absorbed. All absorption processes involve absorption of a photon by the substance being analyzed. If it gives off the excess energy by emitting a photon of less energy than that absorbed; fluorescence or phosphorescence occurs, depending on the lifetime of the excited state.

The emitted energy is normally studied. If the source of radiant energy and the absorbing species are in identical energy states, i.e., in resonance, the excess energy is often given up by the nondirectional emission of a photon whose energy is identical with that absorbed.

Either absorption or emission may be studied,

depending upon the chemical and instrumental circumstances. If the emitted energy is studied, the term "resonance fluorescence" is often used. However, if the absorbing species releases the excess energy in small steps by the process of inter-molecular collision or some other mode, it is commonly understood that this phenomenon falls within the realm of absorption spectroscopy. (The terms absorption spectroscopy, spectrophotometry, and absorptimetry are often used synonymously.)

Most absorption spectroscopy is done in the ultraviolet, visible, and infrared regions of the electromagnetic spectrum. See also emission spectroscopy; infrared spectroscopy.

ABS resin. Any of a group of tough, rigid thermoplastics deriving their name from the three letters of the monomers which produce them; Acrylonitrile-Butadiene-Styrene. Most contemporary ABS resins are true graft polymers consisting of an elastomeric polybutadiene or rubber phase, grafted with styrene and acrylonitrile monomers for compatibility, dispersed in a rigid styrene-acrylonitrile (SAN) matrix. Mechanical polyblends of elastomeric and rigid copolymers, e.g., butadiene-acrylonitrile rubber and SAN, historically the first ABS resins, are also marketed.

Varying the composition of the polymer by changing the ratios of the three monomers and use of other comonomers and additives results in ABS resins with a wide range of properties.

Properties: Dimensional stability over temperature range from -40 to +160°F. Attacked by nitric and sulfuric acids, and by aldehydes, ketones, esters, and chlorinated hydrocarbons. Insoluble in alcohols, aliphatic hydrocarbons, mineral and vegetable oils. Processed by conventional molding and extrusion methods. Sp. gr. 1.04; tensile strength about 6500 psi; flexural strength 10,000 psi; good electrical resistance; water absorption 0.3-0.4%. Nontoxic. Combustible, but slow-burning; flame retardants may be added. Can be vacuum-metallized or electroplated.

Grades: High-, medium-, and low-impact; molding and extrusion.

Uses: Automobile body parts and fittings; telephones; bottles; heels; luggage; packaging; refrigerator door liners; plastic pipe (subject to local building codes); building panels (ditto); shower stalls; boats; radiator grills; machinery housings; business machines.

Note: Several trademarked types are "Cyclocac," "Abson," "Kralastic," "Lustran." For further information refer to Society of Plastics Industry, 250 Park Ave., New York.

abundance. The relative amount (% by weight) of a substance in the earth's crust, including the atmosphere and the oceans.

(a) The abundance of the elements in the earth's crust is:

Rank	Element	% by wt.
1	Oxygen	49.2
2	Silicon	25.7
3	Aluminum	7.5
4	Iron	4.7
5	Calcium	3.4
6	Sodium	2.6
7	Potassium	2.4
8	Magnesium	1.9
9	Hydrogen	0.9
10	Titanium	0.6
11	Chlorine	0.2
12	Phosphorus	0.1

Rank	Element	% by wt.
13	Manganese	0.1
14	Carbon	0.09
15	Sulfur	0.05
16	Barium	0.05
	all others	0.51

(b) The percentages of inorganic compounds in the earth's crust, exclusive of water, are:

(1) SiO ₂	55	(2) Al ₂ O ₃	15	(3) CaCO ₃	8.8
(4) MgO	1.6	(5) Na ₂ O	1.6	(6) K ₂ O	1.9

(c) The most abundant organic materials are cellulose and its derivatives, and proteins.

Note: On the universal scale, the most abundant element is hydrogen.

Ac Symbol for actinium; abbreviation of acetate.

AC. Abbreviation for allyl chloride.

acacia gum. See arabic gum.

acaricide. A type of pesticide effective on mites and ticks (acarides).

"**Accel.**"¹²³ Trademark for a lactic acid starter culture for use in food processing.

accelerator. (1) A compound, usually organic, that greatly reduces the time required for vulcanization of natural and synthetic rubbers, at the same time improving the ageing and other physical properties. Organic accelerators invariably contain nitrogen, and in some cases both nitrogen and sulfur. The latter type are called ultra-accelerators because of their greater activity. The major types include amines, guanidines, thiazoles, thiuram sulfides, and dithiocarbamates. The amines and guanidines are basic, the others acidic. The introduction of organic accelerators in the early twenties was largely responsible for the successful development of automobile tires and mechanical products for engineering uses. A few inorganic accelerators are still used in low-grade products, e.g., lime, magnesium oxide, and lead oxide. See also vulcanization, rubber.

(2) A compound added to a photographic developer to increase its activity, such as certain quaternary ammonium compounds and alkaline substances.

(3) A particle accelerator (q.v.).

acceptor. See donor.

"**Acele.**"²⁸ Trademark for a cellulose acetate fiber.

Properties: Sp. gr. 1.32; tensile strength (psi), 18,000–24,000; break elongation 28%; moisture regain 6%; soluble in glacial acetic acid, acetone, acetonitrile, butyrolactone, dimethyl formamide, dioxane-1,4. Combustible.

Containers: Tubes and cones in cases; beams.

Uses: Textiles.

See also acetate fiber.

acenaphthene (1,8-dihydroacenaphthalene; ethylenenaphthalene) C₁₀H₆(CH₂)₂, a tricyclic compound.

Properties: White needles; sp. gr. 1.024 (99/4°C); freezing point 93.6°C; b.p. 277.5°C; refractive index (100°C) 1.6048. Soluble in hot alcohol; insoluble in water. Combustible.

Derivation: From coal tar.

Grades: Technical; 98%.

Containers: Fiber drums.

Hazard: Irritating to eyes and skin.

Uses: Dye intermediate; pharmaceuticals; insecticide; fungicide; plastics.

acenaphthenequinone (1,2-acenaphthenedione)

C₁₀H₆(CO)₂, a tricyclic compound.

Properties: Yellow needles; m.p. 261–263°C; insoluble in water; soluble in alcohol.

Derivation: By oxidizing acenaphthene, using glacial acetic acid and sodium or potassium dichromate.

Grades: Technical.

Uses: Dye synthesis.

acenocoumarin (3-(alpha-acetonyl-4-nitrobenzyl)-4-hydroxycoumarin) C₁₉H₁₅NO₆.

Properties: White crystalline powder, tasteless and odorless; m.p. 197°C. Slightly soluble in water and organic solvents. Low toxicity.

Use: Medicine (anticoagulant).

acetal (diethylacetal; 1,1-diethoxyethane; ethylenediethyl ether) CH₃CH(OC₂H₅)₂.

Properties: Colorless, volatile liquid; agreeable odor; nutty after-taste. Stable to alkalis but readily decomposed by dilute acids. Forms a constant-boiling mixture with ethyl alcohol. Soluble in alcohol, ether, and water. Sp. gr. 0.831; b.p. 103–104°C; vapor pressure 20.0 mm (20°C); flash point (closed cup) –5°F; specific heat 0.520; refractive index 1.38193 (20°C); wt (lb/gal) 6.89; autoignition temp. 446°F.

Derivation: Partial oxidation of ethyl alcohol, the acetaldehyde first formed condensing with the alcohol.

Grades: Technical.

Containers: Cans; carboys.

Hazard: Highly flammable. Dangerous fire risk. Explosive limits in air 1.65 to 10.4%. Moderately toxic and narcotic in high concentrations.

Uses: Solvent; cosmetics; organic synthesis; perfumes; flavors.

Shipping regulations. (Rail) Flammable liquid, n.o.s.,

Red label. (Air) Flammable Liquid label.

See also acetal resin.

acetaldehyde (acetic aldehyde; aldehyde; ethanal; ethyl aldehyde) CH₃CHO.

Properties: Colorless liquid; pungent, fruity odor. Sp. gr. 0.783 (18/4°C); b.p. 20.2°C; m.p. –123.5°C; vapor pressure 740.0 mm (20°C); flash point –40°F (open cup); specific heat 0.650; refractive index 1.3316 (20°C); wt. 6.50 lb/gal (20°C); miscible with water, alcohol, ether, benzene, gasoline, solvent naphtha, toluene, xylene, turpentine and acetone.

Derivation: (a) oxidation of ethylene; (b) vapor-phase oxidation of ethanol; (c) vapor-phase oxidation of propane and butane; (d) direct conversion of ethylene.

Grades: Technical 99%.

Containers: 5-, 10-, 55-, and 110-gal steel drums; tank cars.

Hazard: Highly flammable and toxic. Dangerous fire and explosion risk. Explosive limits in air 4 to 57%.

Tolerance, 100 ppm in air. Safety data sheet available from Manufacturing Chemists Assn., Washington, D.C.

Uses: Manufacture of acetic acid and acetic anhydride, *n*-butanol, 2-ethylhexanol, peracetic acid, pentaerythritol, pyridines, chloral, 1,3-butylene glycol, and trimethylolpropane; also as intermediate.

Shipping regulations: (Rail) Red label. (Air) Flammable Liquid label.)

acetaldehyde ammonia. See aldehyde ammonia.

acetaldehyde cyanohydrin. See lactonitrile.

Superior numbers refer to Manufacturers of Trade Mark Products. For page number see Contents.

acetal *See* aldol.

acetal resin (polyacetal). A polyoxymethylene thermoplastic polymer obtained by ionically initiated polymerization of formaldehyde (CH_2O) to obtain a linear molecule of the type $-\text{O}-\text{CH}_2-\text{O}-\text{CH}_2-\text{O}-\text{CH}_2-$. Single molecules may have over 1500 $-\text{CH}_2\text{O}-$ units. As the molecule has no side chains, dense crystals are formed. Acetal resins are hard, rigid, strong, tough and resilient; dielectric constant 3.7; dielectric strength 1200 volts/mil (20-mil), 600 volts/mil (80-mil); dimensionally stable under exposure to moisture and heat, resistant to chemicals, solvents, flexing and creep, and have a high gloss and low friction surface. Can be chromium-plated, injection-molded, extruded, and blow-molded. Not recommended for use in strong acids or alkalis. They may be homopolymers or copolymers.

Properties: Sp. gr. 1.425; thermal conductivity 0.13 Btu/hr/sq ft/ $^{\circ}\text{F}/\text{ft}$; coefficient of thermal expansion 4.5×10^{-5} per $^{\circ}\text{F}$; specific heat 0.35 Btu/lb/ $^{\circ}\text{F}$; water absorption 0.41%/24 hr; tensile strength 10,000 psi; elongation 15%; hardness (Rockwell) R120; impact strength (notched) 1.4 ft-lb/in.; flexural strength 14,100 psi; shear strength 9500 psi. Combustible, but slow burning.

Uses: An engineering plastic, often used as substitute for metals, as oil and gas pipes; automotive and appliance parts; industrial parts; hardware; communication equipment; aerosol containers for cosmetics.

See also "Delrin"; "Celcon."

acetamide (acetic acid amine, ethanamide) CH_3CONH_2 . Properties: Colorless deliquescent crystals. Mousy odor. Soluble in water and alcohol; slightly soluble in ether. Sp. gr. 1.159; m.p. 82°C ; b.p. 223°C ; refractive index 1.4274 (78.3°C). Low toxicity. Combustible.

Derivation: Interaction of ethyl acetate and ammonium hydroxide.

Method of purification: Crystallization.

Grades: Technical; C.P. (odorless); intermediate; reagent.

Containers: Fiber cartons.

Uses: Organic synthesis (reactant, solvent, peroxide stabilizer); general solvent; lacquers; explosives; soldering flux; hygroscopic agent; wetting agent; penetrating agent.

acetamido-. Prefix indicating the group $\text{CH}_3\text{CONH}-$. Also called acetamino- or acetylamino-.

5-acetamido-8-amino-2-naphthalenesulfonic acid (acetyl-1,4-naphthalenediamine-7-sulfonic acid; acetylamino-1,6-Cleve's acid) $\text{C}_{10}\text{H}_5(\text{NHCOCH}_3)(\text{NH}_2)(\text{SO}_3\text{H})$. A reddish brown paste.

Hazard: May be toxic.

Use: Chemical intermediate.

8-acetamido-5-amino-2-naphthalenesulfonic acid (acetyl-1,4-naphthalenediamine-6-sulfonic acid; acetylamino-1,7-Cleve's acid)

$\text{C}_{10}\text{H}_5(\text{NHCOCH}_3)(\text{NH}_2)(\text{SO}_3\text{H})$. A paste.

Hazard: May be toxic.

Use: Chemical intermediate.

para-acetamidobenzenesulfonyl chloride. *See* N-acetylsulfanilyl chloride.

acetamidocyanacetic ester. *See* ethyl acetamidocyanacetate.

8-acetamido-2-naphthalenesulfonic acid magnesium salt (acetyl-1,7-Cleve's acid) $[\text{C}_{10}\text{H}_6(\text{CH}_3\text{CONH})(\text{SO}_3)]_2\text{Mg}$.

Properties: Brownish-gray paste containing approximately 80% solids.

Use: Intermediate.

para-acetamidophenol. *See* para-acetylaminophenol.

"Acetamine."⁷²⁸ Trademark for a group of azo dyes and developers made for application to acetate yarn, and especially suited to nylon.

acetamino-. *See* acetamido-.

acetaminophen. *See* para-acetylaminophenol.

acetanilide (N-phenylacetamide) $\text{C}_6\text{H}_5\text{NH}(\text{COCH}_3)$.

Properties: White, shining crystalline leaflets or white, crystalline powder; odorless; stable in air; slightly burning taste; sp. gr. 1.2105; m.p. $114-116^{\circ}\text{C}$; b.p. 303.8°C ; soluble in hot water, alcohol, ether, chloroform, acetone, glycerol and benzene. Flash point 345°F ; combustible; autoignition temp. 1015°F .

Derivation: Acetylation of aniline with glacial acetic acid.

Grades: Technical; C.P.

Containers: 1-lb cartons; bottles; fiber drums; multi-wall paper bags.

Hazard: Moderately toxic by ingestion.

Use: Rubber accelerator; inhibitor in hydrogen peroxide; stabilizer for cellulose ester coatings; manufacture of intermediates (para-nitroaniline, para-nitroacetanilide; para-phenylenediamine); synthetic camphor; pharmaceutical chemicals; dyestuffs; precursor in penicillin manufacture; medicine (antiseptic).

acetanisole. *See* para-methoxyacetophenone.

acetate. (1) A salt of acetic acid in which the terminal H atom is replaced by a metal, as in copper acetate, $\text{Cu}(\text{CH}_3\text{COO})_2$.

(2) An ester of acetic acid where the substitution is by a radical as in ethyl acetate, $\text{CH}_3\text{COOC}_2\text{H}_5$. In cellulose acetate the hydroxyl radicals of the cellulose are involved in the esterification. *See also* cellulose acetate; vinyl acetate.

acetate dye. One group comprises water-insoluble azo or anthraquinone dyes that have been highly dispersed to make them capable of penetrating and dyeing acetate fibers. A second class consists of water-insoluble amino azo dyes that are made water-soluble by treatment with formaldehyde and bisulfite. After absorption by the fiber the resulting sulfonic acids hydrolyze and regenerate the insoluble dyes.

acetate fiber. Generic name for a manufactured fiber in which the fiber-forming substance is cellulose acetate. Where not less than 92% of the hydroxyl groups are acetylated, the term triacetate may be used as a generic description of the fiber (Federal Trade Commission). This fiber was formerly called "acetate rayon" or "acetate silk." The term "rayon" is no longer permissible for this type.

Properties: Thermoplastic; becomes tacky at 350°F . Soluble in acetone and glacial acetic acid; decomposed by concentrated solutions of strong acids and alkalis. Moisture absorption 6%. Tenacity (dry) 1.4 g/denier; (wet) about 1 g/denier. Elongation 50% dry, 40% wet. Combustible.

Uses: Wearing apparel; industrial fabrics.

See also "Acele" (acetate); "Arnel" (triacetate); and following entry.

acetate fiber, saponified. Regenerated cellulose fibers obtained by complete saponification of highly oriented cellulose acetate fibers. Available in continuous filament form having a high degree of crystallinity and great strength.

Properties: Tensile strength (psi) 136,000–155,000; elongation 6%; sp. gr. 1.5–1.6; moisture regain 9.6–10.7%; decomposes about 300°F. Similar to cotton in chemical resistance, dyeing, and resistance to insects and mildew. Combustible.

Uses: Cargo-parachutes; typewriter ribbons; belts; webbing; tapes; carpet backing.

acetate film. A durable, highly transparent film with nondeforming characteristics, produced from cellulose acetate resin. It is grease-, oil-, dust-, and air-proof and hygienic. Combustible.

Available forms: Rolls and cut-to-size sheets.

Uses: Laminates; support for photographic film; document preservation; pressure-sensitive tape; magnetic sound recording tape; window cartons and envelopes; packaging.

acetate of lime. Commercial term for calcium acetate made from pyroligneous acid and milk of lime. There are brown and gray acetates of lime. For further data see calcium acetate.

acetate process. See cellulose acetate.

acethydrazidepyridinium chloride. See Girard's "P" reagent.

acetic acid (ethanoic acid, vinegar acid, methanecarboxylic acid) CH_3COOH . Glacial acetic acid is the pure compound (99.8% min.), as distinguished from the usual water solutions known as acetic acid. It is the end-product of oxidation of fermentation alcohols, as in vinegar (q.v.). 36th highest-volume chemical produced in U.S. (1975).

Properties: Clear, colorless liquid; pungent odor. M.p. 16.63°C; b.p. 118°C (765 mm), 80°C (202 mm); sp. gr. 1.0492 (20/4°C); wt/gal (20°C) 8.64 lb; viscosity (20°C) 1.22 cps; flash point (open cup) 110°F; refractive index 1.3715 (20°C). Miscible with water, alcohol, glycerin, and ether; insoluble in carbon disulfide; autoignition temp. 800°F. Combustible.

Derivation: (a) liquid- and vapor-phase oxidation of petroleum gases (with catalyst); (b) oxidation of acetaldehyde; (c) reaction of methanol and carbon monoxide; (d) directly from naphtha.

Grades: U.S.P. (glacial, 99.4 wt %, and dilute, 36–37 wt %). C.P.; technical (80; 99.5%); commercial (6, 28, 30, 36, 56, 60, 70, 80 and 99.5%); N.F. (diluted; 6.0 g/100 ml).

Containers: 5-lb bottles; 6-, 13-gal carboys; 8.5-, 13-, 55-, 100-gal barrels and drums; tank cars.

Hazard: Moderate fire risk. Pure acetic acid is toxic by ingestion and inhalation, but dilute material is approved by FDA for food use. Strong irritant to skin and tissue. Tolerance, 10 ppm in air. Safety data sheet available from Manufacturing Chemists Assn., Washington, D.C.

Uses: Manufacture of acetic anhydride, cellulose acetate, and vinyl acetate monomer; acetic esters; chloroacetic acid; production of plastics, pharmaceuticals, dyes, insecticides, photographic chemicals, etc.; food additive (acidulant); latex coagulant; oil-well acidizer; textile printing.

Shipping Regulations: Glacial or over 80% acid solution: (Rail) Corrosive liquid, n.o.s., White label. (Air) Corrosive label.

See also vinegar.

acetic acid amine. See acetamide.

acetic acid, glacial. See acetic acid.

acetic aldehyde. See acetaldehyde.

acetic anhydride (acetyl oxide; acetic oxide) $(\text{CH}_3\text{CO})_2\text{O}$.

Properties: Colorless, mobile, strongly refractive liquid; strong odor; sp. gr. 1.0830 (20/20°C); b.p. 139.9°C; f.p. –73.1°C; flash point 121°F (C.C.). Autoignition temp. 732°F; wt/gal (20°C) 9.01 lbs. Miscible with alcohol, ether, and acetic acid; soluble in cold water; decomposes in hot water to form acetic acid. Combustible.

Derivation: (a) oxidation of acetaldehyde with air or oxygen with catalyst; (b) by catalyzed thermal decomposition of acetic acid to ketone.

Grades: C.P., technical (75, 85, 90–95%).

Containers: Bottles; carboys; aluminum drums; tank cars.

Hazards: Strongly irritating and corrosive; may cause burns and eye damage. Tolerance, 5 ppm in air. Moderate fire risk. Safety data sheet available from Manufacturing Chemists Assn., Washington, D.C.

Uses: Cellulose acetate fibers and plastics; vinyl acetate; dehydrating and acetylating agent in production of pharmaceuticals, dyes, perfumes, explosives, etc.; aspirin. Esterifying agent for food starch (5% max.).

Shipping Regulations: (Rail) Corrosive liquid, n.o.s., White label. (Air) Corrosive label.

acetic ester. See ethyl acetate.

acetic ether. See ethyl acetate.

acetic oxide. See acetic anhydride.

acetin (monoacetin; glyceryl monoacetate)

$\text{C}_3\text{H}_7(\text{OH})_2\text{OOCCH}_3$. Acetin may also refer to glyceryl di- or triacetate, also known as diacetin and triacetin (q.v.).

Properties: Colorless, thick liquid; hygroscopic; sp. gr. 1.206 (20/4°C); b.p. 158°C (165 mm); 130°C (3 mm); soluble in water, alcohol; slightly soluble in ether; insoluble in benzene; combustible.

Derivation: By heating glycerol and strong acetic acid, distilling off the weak acetic acid formed and again heating with strong acetic acid and distilling. Method of purification: Rectification.

Hazard: Moderately toxic; irritant.

Uses: Tanning; solvent for dyes; food additive; gelatinizing agent in explosives.

acetoacetanilide (acetylacetanilide)

$\text{CH}_3\text{COCH}_2\text{CONHC}_6\text{H}_5$.

Properties: White, crystalline solid; m.p. 85°C. Resembles ethyl acetoacetate in chemical reactivity. Slightly soluble in water, soluble in dilute sodium hydroxide, alcohol, ether, acids, chloroform, and hot benzene; density 25 lb cu ft. Flash point 325°F; combustible.

Derivation: By reacting ethyl acetoacetate with aniline, eliminating ethyl alcohol. Acetoacetanilide may also be prepared from aniline and diketene.

Grades: Technical.

Containers: Fiber drums.

Uses: Organic synthesis; dyestuffs (intermediate in the manufacture of the dry colors generally referred to as Hansa and benzidine yellows).

acetoacet-ortho-anisidide

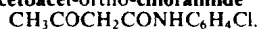
$\text{CH}_3\text{COCH}_2\text{CONHC}_6\text{H}_4\text{OCH}_3$.

Properties: White crystalline powder; m.p. 86.6°C; sp. gr. 1.1320 (86.6/20°C); flash point (open cup) 325°F. Combustible.

Containers: 1-gal cans; 5-, 55-gal drums.

Uses: Intermediate for azo pigments.

Superior numbers refer to Manufacturers of Trade Mark Products. For page number see Contents.

acetoacet-ortho-chloranilide

Properties: White crystalline powder; m.p. 107°C; b.p. decomposes; sp. gr. 1.1920 (107/20°C); flash point (open cup) 350°F. Almost insoluble in water. Combustible.

Containers: 1-gal cans; 5-, 55-gal drums.

Hazard: Moderately toxic, by ingestion.

Use: Intermediate for azo pigments.

acetoacet-para-chloranilide $\text{CH}_3\text{COCH}_2\text{CONHC}_6\text{H}_4\text{Cl}$

Properties: White crystalline powder; m.p. 133°C; b.p. decomposes; flash point (open cup) 320°F. Combustible. Very slightly soluble in water.

Containers: 200-lb drums.

Hazard: Moderately toxic by ingestion.

Use: Intermediate for azo pigments.

acetoacetic acid (acetylacetic acid; diacetic acid; acetone carboxylic acid) $\text{CH}_3\text{COCH}_2\text{COOH}$

Properties: Colorless oily liquid; soluble in water, alcohol, and ether; decomposes below 100°C into acetone and carbon dioxide.

Hazard: Irritant to eyes and skin.

Uses: Organic synthesis.

acetoacetic ester. See ethyl acetoacetate.**acetoacet-para-phenetide**

Properties: Crystalline powder; m.p. 108.5°C; b.p. decomposes; sp. gr. 1.0378 (108.5/20°C); flash point (open cup) 325°F. Combustible.

Containers: 1-gal cans; 5-, 55-gal drums.

Hazard: Moderately toxic by ingestion.

Use: Intermediate for azo pigments.

acetoacet-ortho-toluidide $\text{CH}_3\text{COCH}_2\text{CONHC}_6\text{H}_4\text{CH}_3$

Properties: Fine, white granular powder; m.p. 106°C; b.p. decomposes; density 1.062 g/ml (106°C); slightly soluble in water. Flash point 320°F; combustible.

Grades: Technical.

Hazard: Moderately toxic.

Uses: Intermediate in the manufacture of Hansa and benzidine yellows.

acetoacet-para-toluidide $\text{CH}_3\text{COCH}_2\text{CONHC}_6\text{H}_4\text{CH}_3$

Properties: White crystalline powder; m.p. 93.0–96.0°C; purity, 99% min.

Hazard: Moderately toxic.

Uses: Light-fast yellow pigment intermediate; diazo coupler.

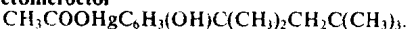
acetoacet-meta-xylylide (AAMX)

Properties: White to light yellow crystalline solid; m.p. 89–90°C; sp. gr. (20°C) 1.238; solubility in water (25°C) 0.5%; flash point 340°F; combustible.

Use: Intermediate for yellow pigments.

acetoaminofluorene. A pesticide. May not be used in food products or beverages (FDA).

Hazard: Toxic by ingestion.

para-acetoanisole. See para-methoxyacetophenone.**acetoglyceride**. Usually an acetylated monoglyceride although commercial acetoglycerides will contain di- and triglycerides. See acetostearin.**acetoin**. See acetyl methylcarbinol.**acetol**. See hydroxy-2-propanone.**acetomerocetol**

Properties: White solid; m.p. 155–157°C; freely soluble in alcohol; soluble in ether or chloroform; sparingly soluble in benzene; insoluble in water.

Hazard: Toxic by ingestion.

Use: Medicine (antiseptic, solution 1:1000)

Shipping regulations: (Rail, Air) Mercury compounds, solid, n.o.s., Poison label.

acetone (dimethylketone; 2-propanone) CH_3COCH_3

40th highest-volume chemical produced in U.S. (1975).

Properties: Colorless volatile liquid; sweetish odor. M.p. –94.3°C; b.p. 56.2°C; refractive index (20°C) 1.3591; sp. gr. (20/20°C) 0.792; wt/gal (15°C) 6.64 lb; flash point (open cup) 15°F. Autoignition temp. 1000°F. Miscible with water, alcohol, ether, chloroform and most oils.

Derivation: (a) Oxidation of cumene (q.v.); (b) dehydrogenation or oxidation of isopropyl alcohol with metallic catalyst (c) vapor-phase oxidation of butane; (d) by-product of synthetic glycerol production.

Grades: Technical; C.P.; N.F.; electronic; spectrophotometric.

Containers: Cans; drums; tank cars; tank trucks.

Hazard: Flammable; dangerous fire risk. Explosive limits in air 2.6 to 12.8%. Tolerance, 1000 ppm in air.

Safety data sheet available from Manufacturing Chemists Assn., Washington, D.C.

Uses: Chemicals (methyl isobutyl ketone, methyl isobutyl carbinol; methyl methacrylate; bisphenol-A); paint, varnish and lacquer solvent; cellulose acetate, especially as spinning solvent; to clean and dry parts of precision equipment; solvent for potassium iodide and permanganate; delusterant for cellulose acetate fibers; specification testing of vulcanized rubber products.

Shipping regulations: (Rail) Red label. (Air) Flammable Liquid label.

acetone bromoform. See tribromo-*tert*-butyl alcohol.**acetonecarboxylic acid**. See acetoacetic acid.**acetone chloroform**. See chlorobutanol.**acetone cyanohydrin** (alpha-hydroxyisobutyronitrile; 2-methylactonitrile) $(\text{CH}_3)_2\text{COHCN}$

Properties: Colorless liquid; b.p. 82°C (23 mm); m.p. –20°C; density 0.932 (19°C); refractive index n_D^{20} 1.3996; flash point 165°F; soluble in water, alcohol, and ether. Combustible; autoignition temp. 1270°F.

Derivation: Condensing acetone with hydrocyanic acid.

Grades: Technical (97–98% pure).

Containers: 6-gal carboys; 380-lb drums.

Hazard: Toxic. Readily decomposes to hydrocyanic acid and acetone.

Uses: Insecticides; intermediate for organic synthesis, especially methyl methacrylate.

Shipping regulations: (Rail, Air) Poison label.

acetonedicarboxylic acid. See beta-ketoglutaric acid.**acetone oxime**. See acetoxime.**acetone semicarbazone** $(\text{CH}_3)_2\text{CNNHCONH}_2$. White powder; m.p. 188°C. A chemical intermediate.**acetone sodium bisulfite**. See sodium acetone bisulfite.**acetonitrile** (methyl cyanide) $\text{CH}_3\text{C}\equiv\text{N}$

Properties: Colorless, limpid liquid; aromatic odor; sp. gr. 0.783; m.p. –41°C; b.p. 82°C; flash point 42°F. Soluble in water and alcohol; high dielectric constant; high polarity; strongly reactive.

Derivation: By-product of propylene-ammonia process for acrylonitrile.

Grades: Technical; nanograde; spectrophotometric.

Containers: Drums; tank cars; tank trucks.

Hazard: Toxic. Flammable, dangerous fire risk. Tolerance, 40 ppm in air.