Condensed Chemical Dictionary

11th

NINTH EDITION 1987

Revised by

GESSNER G. HAWLEY

Coeditor, Encyclopedia of Chemistry
Coauthor, Glossary of Chemical Terms

212 254-3232 1-800 926-2665

VNR VAN NOSTRAND REINHOLD COMPANY
NEW YORK CINCINNATI ATLANTA DALLAS SAN FRANCISCO
LONDON TORONTO MELBOURNE

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

Van Nostrand Reinhold Company International Offices:
London Toronto Melbourne

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

Manufactured in the United States of America

Published by Van Nostrand Reinhold Company
450 West 33rd Street, New York, N.Y. 10001

Published simultaneously in Canada by Van Nostrand Reinhold Ltd.

15 14 13 12 11 10 9 8 7 6 5 4 3

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

The Condensed chemical dictionary.

1. Chemistry—Dictionaries. I. Hawley, Gessner Goodrich, 1905–
QD5.C5 1976 540′.3 76-19024
[illegible]BN 0-442-23240-3

cals; industrial lubricant; electrical insulating compounds; mfg. of Turkey Red oil (q.v.); source of sebacic acid and of ricinoleates; medicine (laxative).
See also castor oil, dehydrated; blown oil.

castor oil, acetylated. See glyceryl triacetylricinoleate.

castor oil acid. See ricinoleic acid.

castor oil, blown. See blown oil.

castor oil, dehydrated (DCO). A castor oil from which about 5% of the chemically combined water has been removed, and which as a result, has drying properties similar to those of tung oil. Dehydration is carried out commercially by heating the oil in the presence of catalysts, such as sulfuric and phosphoric acids, clays, and metallic oxides. The commercial product is offered in a wide range of viscosities and analytical constants. Used in protective coatings and alkyd resins.

castor oil, hydrogenated. Principally glyceryl tri-12-hydroxystearate (q.v.). A hard, waxy product used in making hydroxystearic acid.

castor oil, polymerized. A rubber-like polymer results from combination of castor oil with sulfur or diisocyanates; this can be blended with polystyrene to give a tough, impact-resistant product.

castor oil, sulfonated. See Turkey red oil.

castor seed oil meal (castor cake; castor meal). The residue from extraction of oil from the castor seed (ricinus). The normal product contains 29.5% crude protein; 35.8% crude fiber; 13.2% nitrogen-free extract and 1.0% crude fat. The total digestible nutrients approximate 25%. The ash content of 7.5% is high in potash and phosphate.
Containers: Bag or bulk; carlots.
Hazard: Contains highly toxic ricin which must be removed before internal use.
Use: Animal feeds (after removal of toxic ingredients); fertilizer.

“Castorwax.”[202] Trademark for hydrogenated castor oil, the triglyceride of 12-hydroxystearic acid.
Properties: White, hard, synthetic wax; m.p. 85°C; sp. gr. 0.9990 (25°C); acid value 2; iodine value 3; saponification value 180; insoluble in most organic solvents at room temperature and compatible with ethylcellulose, cellulose acetate butyrate, polyethylene (up to 25%), polymethacrylate, rosin, shellac, natural and synthetic rubbers, insect and vegetable waxes.
Uses: Potting compounds, greases, sealants and impregnating compositions; wax blends where increase in grease and solvent resistance, hardness and melting point is desired; blending agent and viscosity reducer in hot melts; direct application to paper for resistance to moisture and fat.

“Castung.”[202] Trademark for dehydrated castor oil. See castor oil, dehydrated.

nature, catalysis is the “loosening” of the chemical bonds of two (or more) reactants by another substance, in such a way that a fractionally small percentage of the latter can greatly accelerate the rate of the reaction, while remaining unconsumed. (See catalyst). Thus one part by volume of catalyst can activate thousands of parts of reactants. Though the mechanism of their action is not completely known, the electronic configuration of the surface molecules of the catalyst is often the critical factor. The surface irregularities give rise to so-called “active points,” at which intermediate compounds can form. Most industrial catalysis is performed by finely divided transition metals or their oxides.

Solid catalysts may combine chemically (bond) at the surface with one or more of the reactants. This is known as chemisorption, and occurs on only a small portion of the catalyst surface (i.e., at the active points); it results in changing the chemical nature of the chemisorbed molecules. Catalysis of chemical reactions by surfaces must proceed by chemisorption of at least one of the reactants.
See also catalyst; chemisorption; hydrogenation; enzyme.

catalysis, heterogeneous. A catalytic reaction in which the reactants and the catalyst comprise two separate phases, e.g., gases over solids, or liquids containing finely divided solids as a disperse phase.

catalysis, homogeneous. A catalytic reaction in which the reactants and the catalyst comprise only one phase, e.g., an acid solution catalyzing other liquid components.

catalyst. Any substance of which a fractional percentage notably affects the rate of a chemical reaction without itself being consumed or undergoing a chemical change. Most catalysts accelerate reactions, but a few retard them (negative catalysts or inhibitors). Catalysts may be inorganic, organic, or a complex of organic groups and metal halides (see catalyst, stereospecific). They may be either gases, liquids, or solids. In some cases their action is destructive and undesirable, as in the oxidation of iron to its oxide, which is catalyzed by water vapor, and similar types of corrosion. The life of an industrial catalyst varies from 1000 to 10,000 hours, after which it must be replaced or regenerated.
Note: Though it is not a “substance,” light in the visible wavelengths can act as a catalyst, as in photosynthesis and other photochemical reactions.

Following is a partial list of catalysts; the asterisk indicates a destructive effect.

Substance	*Reaction type*
aluminum chloride	condensation (Friedel-Crafts)
aluminum alkyl + titanium chloride	Ziegler catalyst for stereospecific polymers

	dehydration; isomerization
iron	ammonia synthesis; hydrocarbon synthesis
iron oxide	dehydrogenation (oxidation)
manganese dioxide	oxidation
molybdenum oxide	dehydrogenation; polymerization; aromatization; partial oxidation
nickel	hydrogenation (oils to fats)
phosphoric acid	polymerization; isomerization
platinum metals	hydrogenation; aromatization
silica-alumina	cracking hydrocarbons
silver	hydration; oxidation
sulfuric acid	isomerization; corrosion*
vanadium pentoxide	oxidation (sulfuric acid)
water (esp. + NaCl)	oxidation (corrosion)*

Catalysts are highly specific in their application; they are widely used in the petroleum-refining, synthetic organic chemical and pharmaceutical industries. For details of application, see the preceding list. Since the activity of a solid catalyst is often centered in a small fraction of its surface, the number of active points can be increased by adding promoters (q.v.), which increase the surface area in one way or another, e.g., by increasing porosity. Catalytic activity is decreased by substances that act as poisons (q.v.), which clog and weaken the catalyst surface, e.g., lead in the catalytic converters used to control exhaust emissions.

Besides inorganic substances, there are many organic catalysts that are vital in the life processes of plants and animals. These are called enzymes (q.v.) and are essential in metabolic mechanisms, e.g., pepsin in digestin. Vitamins and hormones also have catalytic properties. See also catalysis; catalyst, stereospecific; enzyme.

catalyst, negative. See inhibitor.

catalyst, organic. See enzyme.

catalyst, stereospecific. An organometallic catalyst which permits control of the molecular geometry of polymeric molecules. Examples are Ziegler and Natta catalysts derived from a transition metal halide and a metal alkyl, or similar substances. There are many patented catalysts of this general type, most of them developed in connection with the production of polypropylene, polyethylene, or other polyolefins. See also polymer, stereospecific; Natta catalyst; Ziegler catalyst.

catalyst, thermonuclear. See carbon cycle (2).

catechol. See pyrocatechol.

catenane. A compound with interlocking rings, which are not chemically bonded, but which cannot be separated without breaking at least one valence bond. The model would resemble the links of a chain.

cathode. The negative electrode of an electrolytic cell, to which positively charged ions migrate when a current is passed, as in electroplating baths. The cathode is the source of free electrons (cathode rays) in a vacuum tube. In a primary cell (battery), the cathode is the positive electrode. See also anode; electrode.

cathode sputtering. See sputtered coating.

cation. An ion having a positive charge. Cations in a liquid subjected to electric potential collect at the negative pole or cathode.

cation exchange. See ion exchange.

cationic reagent. One of several surface-active substances in which the active constituent is the positive ion. Used to flocculate and collect minerals that are not flocculated by oleic acid or soaps (in which the surface-active ingredient is the negative ion). Reagents used are chiefly quaternary ammonium compounds e.g., cetyl trimethyl ammonium bromide.

catlinite (pipestone). A fine-grained silicate mineral related to pyrophyllite which is easily compressible, has high surface friction, and is used for gaskets in very high-pressure equipment.

"Cato."[53] Trademark for a cationic derivative of starch, available in ungelatinized or gelatinized (cold water soluble) form. Used in manufacture of paper, warp sizing, etc.

"Cat-Ox."[58] Proprietary catalytic oxidaton process for removing sulfur dioxide and fly ash from stack gases and converting the former to sulfuric acid. It involves passing the flue gases at 900°F (1) through an electrostatic precipitator, (2) through a converter where sulfur dioxide is oxidized to the trioxide with vanadium pentoxide, (3) through heat exchangers to cool the gases so that the SO_3 combines with water vapor, and (4) through an absorbing tower which condenses the sulfuric acid. Commercial acid (70%) is made in this way. See also sulfuric acid.

caulking compound. See sealant.

caustic. (1) Unqualified, this term usually refers to caustic soda (sodium hydroxide). (2) As an adjective, it refers to any compound chemically similar to sodium hydroxide, e.g., caustic alcohol (C_2H_5ONa). (3) Any strongly alkaline material which has a corrosive or irritating effect on living tissue.

caustic baryta. See barium hydroxide.

causticized ash. Combinations of soda ash and caustic soda in definite proportions marketed for purposes where an alkali is needed ranging in causticity between the two materials. Causticized ash is usually designated by its caustic soda content and the range of standard marketed products embraces 7%, 10%, 15%, 25%, 36%, 45%, and 67% of caustic soda.

caustic lime. See calcium hydroxide.

caustic potash. See potassium hydroxide. Caustic potash, liquid, is the legal label name for potassium hydroxide solution.

as the fluorosteroids (dexamethasone).

sterol. A steroid alcohol. Such alcohols contain the common steroid nucleus, plus an 8 to 10-carbon-atom side-chain and a hydroxyl group. Sterols are widely distributed in plants and animals, both in the free form and esterified to fatty acids. Cholesterol (q.v.) is the most important animal sterol; ergosterol is an important plant sterol (phytosterol).

"Sterosan."[219] Trademark for a brand of chlorquinaldol (q.v.).

"Sterox."[58] Trademark for a series of nonionic surface-active agents including polyoxyethylene ethers, and polyoxyethylene thioethers.

STH. See somatotropic hormone.

stibic anhydride. See antimony pentoxide.

stibine. See antimony hydride.

stibium. The Latin name for the element antimony; hence the symbol Sb.

stibnite (gray antimony; antimony glance; antimonite) Sb_2S_3.
Properties: Lead gray mineral; subject to blackish tarnish; metallic luster. Soluble in concentrated boiling hydrochloric acid with evolution of H_2S. Sp. gr. 4.52–4.62; Mohs hardness 2.
Occurrence: Japan; China; Mexico; Bolivia, Peru, South Africa.
Use: The most important ore of antimony.

stibophen $C_{12}H_4Na_5O_{16}S_4Sb \cdot 7H_2O$. Sodium antimony II bis(catechol-2,4-disulfonate) heptahydrate.
Properties: White, crystalline, odorless powder. Affected by light. Freely soluble in water; nearly insoluble in alcohol, ether, and chloroform.
Derivation: Reaction of sodium pyrocatechol-3,5-disulfonate with antimony trioxide and precipitating with alcohol.
Grade: U.S.P.
Use: Medicine.

stigmasterol $C_{29}H_{48}O \cdot H_2O$. A plant sterol.
Properties: Anhydrous form has m.p. of 170°C. Insoluble in water; soluble in usual organic solvents. Combustible.
Derivation: From soy or calabar beans.
Uses: Preparation of progesterone and other important steroids.

stilbene (toluylene; trans form of alpha, beta-diphenylethylene) $C_6H_5CH{:}CHC_6H_5$.
Properties: Colorless or slightly yellow crystals; sp. gr. 0.9707; m.p. 124–125°C; b.p. 306–307°C. Soluble in benzene and ether; slightly soluble in alcohol; insoluble in water. Combustible.
Derivation: By passing toluene over hot lead oxide.
Method of purification: Crystallization; zone melting used for very pure crystals.

stilbestrol. See diethylstilbestrol.

stillage. The grain residue from alcohol production, used in feeds and feed supplements.

Stock system. See chemical nomenclature.

Stoddard solvent. A widely used dry-cleaning solvent. U.S. Bureau of Standards and ASTM D—484—52 define it as a petroleum distillate clear and free from suspended matter and undissolved water, and free from rancid and objectionable odor. The minimum flash point is 100°F. Distillation range: not less than 50% over at 350°F (177°C), 90% over at 375°F (190°C), and the end point not higher than 410°F (210°C). Autoignition temp. 450°F. Combustible.
Containers: 55-gal steel drums; tank cars; tank trucks.
Hazard: Moderate fire risk. Moderately toxic by ingestion. Tolerance, 200 ppm in air.

"Stod-Sol."[200] Trademark for a petroleum solvent prepared by straight-run distillation.
Properties: Water-white; initial boiling point 308–316°F, 95% distills between 363–373°F; sp. gr. 0.780 (60°F); flash point (TCC) 103°F; mild, nonresidual odor. Combustible.
Hazard: Moderate fire risk.
Use: Dry cleaning.

stoichiometry. The branch of chemistry and chemical engineering that deals with the quantities of substances that enter into and are produced by chemical reactions. For example, when methane unites with oxygen in complete combustion, 16 grams of methane require 64 grams of oxygen. At the same time 44 grams of carbon dioxide and 36 grams of water are formed as reaction products. Every chemical reaction has its characteristic proportions. The methods of obtaining these from chemical formulas, equations, atomic weights and molecular weights, and determination of what and how much is used and produced in chemical processes is the major concern of stoichiometry.

Stokes' law. (1) The rate at which a spherical particle will rise or fall when suspended in a liquid medium varies as the square of its radius; the density of the particle and the density and viscosity of the liquid are essential factors. Stokes' law is used in determining sedimentation of solids, creaming rate of fat particles in milk, etc. The equation is:

$$v = \frac{h}{t} = \frac{gD^2(\rho_s - \rho_1)}{18\eta}$$

where v is the terminal velocity, h the height of fall, t the time, g the gravitational constant, D, the particle diameter, ρ_s, ρ are the densities of the solid and the suspending medium, respectively, and η is the viscosity.

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