



*Hawley's*  
*Condensed Chemical*  
*Dictionary*

*TWELFTH EDITION*

*Revised by*  
Richard J. Lewis, Sr.

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VAN NOSTRAND REINHOLD COMPANY

New York

IP Bridge Exhibit 2003  
TSMC v. Godo Kaisha IP Bridge 1



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Library of Congress Catalog Card Number 92-18951  
ISBN 0-442-01131-8

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Printed in the United States of America

Published by Van Nostrand Reinhold  
115 Fifth Avenue  
New York, NY 10003

Chapman and Hall  
2-6 Boundary Row  
London, SE1 8HN

Thomas Nelson Australia  
102 Dodds Street  
South Melbourne 3205  
Victoria, Australia

Nelson Canada  
1120 Birchmount Road  
Scarborough, Ontario M1K 5G4, Canada

16 15 14 13 12 11 10 9 8 7 6 5 4 3 2

Library of Congress Cataloging-in-Publication Data

Condensed chemical dictionary.

Hawley's condensed chemical dictionary.—12th ed./revised by  
Richard J. Lewis, Sr.

p. cm.

ISBN 0-442-01131-8

I. Chemistry—Dictionaries. I. Hawley, Gessner Goodrich, 1905-1983

II. Lewis, Richard J., Sr. III. Title.

QD5.C5 1992

540'.3—dc20

92-18951

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polyethylene). It also may be a drawn metal (tungsten, gold) or a metal carbide.  
See fiber.

**filament winding.** The process of winding fibers under tension onto a prepared core. Before or during the winding operation, the assembly is impregnated with a thermosetting resin. Structures of considerable size and strength can be made in this way. The fibers used are chiefly glass, boron, or silicon carbide.  
See filament.

**filler.** (1) An inert mineral powder of rather high specific gravity (2.00–4.50) used in plastic products and rubber mix to provide a certain degree of stiffness and hardness and to decrease cost. Examples are calcium carbonate (whiting), barytes, blanc fixe, silicates, glass spheres and bubbles, slate flour, soft clays, etc. Fillers have neither reinforcing nor coloring properties, and the term should not be applied to materials that do, i.e., reinforcing agents or pigments. Fillers are similar to extenders and diluents in their cost-reducing function; exact lines of distinction between these terms are difficult, if not impossible, to draw. Use of fillers and extenders in plastics has increased in recent years due to shortages of basic materials.

(2) The cross or transverse thread in a fabric or other textile structure.

(3) A metal or alloy used in brazing and soldering to effect union of the metals being joined.

See also diluent, extender, reinforcing agent.

**film.** An extremely thin continuous sheet of a substance which may or may not be in contact with a substrate. There is no precise upper limit of thickness, but a reasonable assumption is 0.010 inch. The protective value of any film depends on its being 100% continuous, i.e., without holes or cracks, since it must form an efficient barrier to molecules of atmospheric water vapor, oxygen, etc. A long-chain fatty acid or alcohol on water produces a film whose "thickness" is the length of one molecule (approximately 200 Å). The fatty acid molecules are oriented with the radical end in the water. Such films are good evaporation barriers and have been successfully imposed on glass. Soap bubbles are elastic films about one micron thick and have considerable strength.

Film-forming agents (drying oils) are essential in paints and lacquers. Oxide films formed automatically on the surface of aluminum protect it from corrosion. Thin metallic oxide films are widely used in electronic and semiconducting devices. Electro-deposited metals (chromium, copper, nickel) are conventionally (and perhaps illogically) called coatings.

The term "film" is also applied to sheets of

cellophane, polyethylene, polyvinylidene chloride, etc., used for wrapping and packaging of food products, meats, and poultry (especially shrink films which are stretched before application). These function as a moisture vapor barrier. Plastic films are also used as slip surfaces in concrete structures such as air strips, ice rinks, and highways. Photographic film is made from cellulose acetate.

**filter.** See filtration; leaf, filter; baghouse.

**filter aid.** See filter media, filtration.

**filter alum.** See aluminum sulfate.

**filter medium.** Almost any water-insoluble porous material having a reasonable degree of rigidity can serve as a filter. Sand is used in simple large-scale water filtration, the voids between the grains providing the porosity. In industrial operations, cotton duck, woven wire cloth, nylon cloth, and glass cloth are used. For laboratory work, Whatman filter paper, diatomaceous earth, and closely packed glass fibers are standard materials. Plastics membranes containing over a million pores per square inch are used in bacteriological filtration.

See also filtration; screen.

**filter sand.** Sand used to separate sediment and suspended matter from water.

**filtration.** The operation of separating suspended solids from a liquid (or gas) by forcing the mixture through a porous barrier (see filter media). The construction and operation of the many kinds of industrial filtration equipment are too detailed to permit description. The most widely used types may be classified as follows: (1) gravity filters, used largely for water purification and consisting of thick beds of sand and gravel which retain the flocculated impurities as the water passes through, (2) pressure filters of plate-and-frame or shell-and-leaf construction which utilize filter cloths of coarse fabric as a separating medium, (3) vacuum or suction filters of the rotating drum or disk type, used on thick sludges and slurries, (4) edge filters, (5) clarification filters, (6) bag filters (dust collectors). Gel filtration is a chromatographic technique involving separation at the molecular level. For bacteriological filtration, membranes having over a million pores per square inch are used, e.g., collodion or synthetic film. Some types of viruses will pass through such membranes and are thus known as filterable viruses.

See baghouse.

**"Filtrol" [Filtrol].** TM for acid-activated clays used as decolorizing adsorbents and catalysts.