CHEMICAL RESISTANCE CHART

The degree of protection required on a given job is known only by you. This chemical resistance or permeation chart developed by our laboratory or from data published by manufacturers of resins, rubber or polymers can only serve as a guide.

Degradation or permeation will occur at some time depending on the degree of exposure. You must determine this by testing. That is why we offer our Performance Rated Order (PRO) Program. Ask your distributor for complete details.

Select the coating with the highest rating in the Physical Properties Chart on the right, then check the Chemical Resistance Charts below.

Key to chart:

E	Excellent
G	Good
F	Fair
P	Poor
Blank (–)	Insufficient data
NR	Not recommended

CHEMICAL	NITRILE	NATURAL RUBBER	PVC	NEOPRENE
Acetaldehyde	F	F	F	E
Acetic Acid	G	G	G	E
Acetone	P	G	P	G
Acrylonitrile	P	F	P	P
Aluminum Chloride	E	E	E	E
Ammonium Fluoride 40%	E	E	E	E
Ammonium Hydroxide	F	G	E	E
Amyl Acetate	P	F	P	NR
Amyl Alcohol	G	G	–	E
Aniline	P	P	G	G
Animal Fats	E	P	G	E
Aqua Regia	F	G	G	G
Battery Acid	S	G	E	E
Benzaldehyde	P	F	F	NR
Benzene	F	P	P	NR
Benzyl Alcohol	P	P	–	E
Benzyl Chloride	P	P	–	P
Butane	E	P	P	E
Butyl Acetate	P	P	P	NR
Butyl Alcohol	E	E	G	E
Butyl Cellosolve*	E	E	–	E
Butyraldehyde	P	P	G	–
Calcium Hypochlorite	G	G	–	F
Carbolic Acid	P	P	–	F
Carbon Disulfide	G	NR	NR	NR
Carbon Tetrachloride	G	P	P	NR
Castor Oil	E	E	F	E
Cellosolve* Acetate	F	G	–	F
Cellosolve* Solvent	G	E	–	E
Chlorine (dry)	P	P	–	F
Chlorine (wet)	F	F	–	NR
Chloroacetone	P	P	–	G
Chlorobenzene	P	P	P	NR
Chloroform	P	P	P	NR
Chloronaphthalene	P	NR	NR	NR
Chlorothene* VG	F	NR	P	NR
Chromic Acid	P	P	G	NR
Citric Acid	E	E	E	E
Cottonseed Oil	E	P	G	G
Creosote	G	P	G	F
Cutting Oil	E	F	F	E
Cyclohexane	E	P	F	NR
Cyclohexanol	G	P	F	E
Diacetone Alcohol	P	P	P	G
Dibenzyl	P	P	–	NR
Dibutyl Phtalate	P	P	–	F
Diethylamine	F	F	F	P
Di-Isobutyl Ketone	P	G	P	P
Di-Isocyanate	G	P	F	P
Dimethyl Formamide	F	P	P	G
Dimethyl Sulfoxide, DMSO	E	E	F	E
Dioxane	P	P	P	NR
Dyestuff	S	E	E	E
Electroless Copper (MacDermid 9048)	E	E	E	E
Electroless Nickel (MacDermid V60/61)	E	E	E	E
Epoxy Resins	E	E	E	E
Ethyl Acetate	P	P	P	E
Ethyl Alcohol	E	E	G	E
Ethyl Ether	F	P	P	E
Ethyl Formate	P	P	P	G
Ethylene Dichloride	P	P	P	NR
Ethylene Glycol	E	E	E	E
Ethylene Trichloride	P	P	–	NR
Fluorine	F	F	–	NR
Formaldehyde	F	F	G	E
Formic Acid 90%	F	E	E	E
Freon TF	E	NR	NR	G
Furfural	P	P	P	G
Gasoline	E	P	P	NR
Glycerin	E	E	F	E
Hexane	E	P	F	E
Hydraulic Fluid-Petroleum Base	E	P	G	G
Hydraulic Fluid-Ester Base	P	P	P	NR
Hydrazine 65%	E	G	E	E
Hydrobromic Acid	P	E	–	–
Hydrochloric Acid 38%	G	G	G	E
Hydrochloric Acid 10%	E	E	E	E
Hydrofluoric Acid 48%	F	F	F	E
Hydrogen Peroxide 30%	F	F	F	E
Hydroquinone	F	G	F	E
Insecticides	S	E	E	E
Isobutyl Alcohol	G	E	G	E
Iso-Octane	E	P	P	E
Isopropyl Alcohol	G	E	G	E
Kerosene	E	P	F	E
Lacquer Thinner	G	NR	F	F
Lactic Acid	E	E	G	E
Lard	E	P	–	F
Lauric Acid 36%-EtOH	E	G	F	E
Linoleic Acid	E	P	G	E
Linseed Oil	E	P	F	E
Lubricating Oils (Petroleum)	E	P	–	G
Maleic Acid	P	P	G	E
Methyl Acetate	P	P	–	G
Methyl Alcohol	E	E	E	E
Methyl Bromide	G	F	P	NR
Methyl Cellosolve	F	P	–	E
Methylene Chloride	P	P	P	NR
Methyl Ethyl Ketone (M.E.K.)	P	G	P	P
Methyl Formate	P	P	–	NR
Methyl Isobutyl Ketone	P	F	F	NR
Methylamine	F	F	F	E
Methyl Methacrylate	P	P	F	NR
Mineral Oil	E	P	F	G
Mineral Spirits, Rule 66	E	NR	F	G
Monoethanolamine	P	G	G	E
Morpholine	P	F	G	P
Muriatic Acid	G	G	G	G
Naptha	E	P	P	G
Nitric Acid – Concentrated 70%	P	P	F	G
Nitric Acid – Diluted 10%	F	F	G	E
Nitric Acid - Red Fuming	P	P	P	NR
Nitric Acid – White Fuming	NR	NR	P	NR
Nitrobenzene	F	P	P	NR
Nitromethane	P	G	P	G
Nitropropane 95.5%	NR	E	NR	G
Octyl Alcohol	G	G	F	E
Oleic Acid	F	P	F	E
Olive Oil	E	P	F	G
Oxalic Acid	G	G	G	E
PCB's	F	P	P	–
Paint Remover	G	F	P	F
Palmitic Acid Saturated	G	G	G	E
Pentane	E	P	NR	E
Perchloric Acid 60%	P	P	P	E
Perchloroethylene	F	P	P	NR
Peuta	E	F	E	G
Phenol	P	P	G	E
Phosphoric Acid	G	G	P	E
Pickling Solution	P	P	G	F
Picric Acid	G	G	G	E
Pine Oil	G	P	F	P
Plating Solutions - Chrome	E	G	E	–
Potassium Hydroxide 50%	G	G	E	E
Printing Ink	E	G	F	E
Propane	E	P	F	E
Propyl Acetate	P	P	F	P
Propyl Alcohol	E	E	G	E
Propylene Oxide	P	P	–	NR
Rubber Solvent	E	NR	NR	G
Silicon Etch	NR	NR	F	G
Skydrol 500	P	P	P	NR
Sodium Hydroxide 50%	G	E	E	E
Sodium Hypochlorite	G	G	–	G
Soybean Oil	E	P	–	E
Stearic Acid	G	G	G	G
Stoddard Solvent	E	P	F	E
Styrene	P	P	P	NR
Sulfuric Acid (diluted)	G	G	G	G
Sulfuric Acid (conc.) 95%	P	P	F	F
Tannic Acid 65%	E	E	E	E
Tetrahydrofuran	P	P	P	NR
Toluene	F	P	P	NR
Toluene Di-Isocyanate	P	P	P	NR
Trichlorethylene	F	P	P	NR
Triethanol Amine	F	G	G	E
Trinitrotoluene	P	P	F	G
Tung Oil	E	P	F	E
Turbine Oil	G	P	P	G
Turpentine	E	P	F	NR
Vegetable Oil	E	P	F	E
Vinyl Chloride	–	–	–	NR
Xylene	F	P	P	NR

PHYSICAL PROPERTIES	NITRILE	NATURAL RUBBER	PVC	NEOPRENE
Abrasion Resistance	E	G	G	G
Cut Resistance	E	E	P	E
Puncture (snag) Resistance	E	E	G	E
Flexibility	E	E	G	G
Heat Resistance	G	F	P	G
Ozone Resistance	F	P	E	E
Tensile Strength	E	E	F	E
Dry Grip	E	E	E	E
Wet Grip	G	E	E	F

NOTE: Products in these categories vary in capabilities. Laboratory tests are necessary for specific recommendations.

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Cellosolve® is a registered trademark of the Union Carbide Corp.

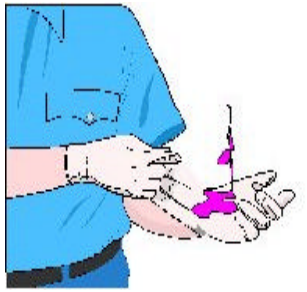
A GUIDE TO PERSONAL PROTECTIVE EQUIPMENT AND GLOVE SELECTION

Personal Protective Equipment (PPE)

Hazardous materials may enter the body though inhalation, ingestion or skin/eye contact. All staff must wear proper PPE in order to prevent injuries and illnesses caused by known workplace hazards. Wearing proper PPE is everyone's responsibility. Substituting or eliminating hazardous chemicals should be considered first, but when that is not feasible PPE should be used. PPE is often used concurrently with engineering controls for maximum protection. In order to determine the appropriate PPE, the hazards and reduction methods must be evaluated and selection made based on the risks identified from the initial evaluation.

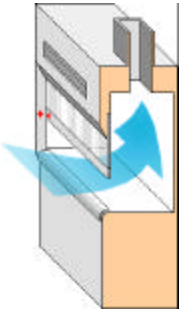
Evaluation

- Survey areas and identify potential hazards.
- Evaluate the exposure risk to individuals performing the tasks.
- Evaluate alternate means of reducing the hazard (substitution, engineering controls, or administrative controls). If not possible, then PPE is necessary.



Hazard Reduction

- Substitution: some materials may be substituted with a less hazardous alternative. This is always a primary means of addressing a risk.
- Engineering Controls: substitution is not feasible, then engineering controls must be evaluated. These include ventilation, local exhaust ventilation, and chemical fume hoods.
- Administrative Controls: if substitution and engineering controls are not adequate to reduce a risk, then administrative controls must be assessed. These include reducing the amount of time an individual performs a task, or changing the person's job duties.



- Personal Protective Equipment: if substitution, engineering controls or administrative controls do not reduce the risk, then PPE must be used.

Selection

- Select PPE based on the identified hazards, the specific task, the duration of exposure, regulatory exposure limits, and the individual worker.
- PPE should be appropriate for the particular hazard.

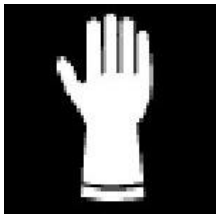
Types of PPE Available

- Hand protection (gloves).
- Eye and face protection (safety goggles, face shields, and splash-guards).
- Skin protection (lab coats, scrubs, aprons, tyvek suits, etc.).
- Respiratory protection (half-face or full-face respirators, personal air-purifying respirators).

For more detailed information, refer to your Environmental Health and Safety Manual or Chemical Hygiene Plan, or call your Chemical Hygiene Officer.

Choosing the Right Glove

Gloves are used to protect your skin from contact with hazardous materials. There are a variety of glove materials (e.g., latex, nitrile, and neoprene) that offer different levels of protection depending on the chemicals that you use in the course of your work. There is no universal glove that is appropriate for all chemicals, and all chemicals eventually penetrate all common glove materials. A glove you are wearing may appear to be intact even when it is not. Therefore, it is important to choose the right type of glove to wear when using a particular substance so you will not be unknowingly exposed to a hazardous material.



Glove manufacturers rate their gloves for use with specific chemicals. These ratings are based on breakthrough or permeability tests that determine the amount of time it takes for a chemical to penetrate the glove. A breakthrough test is generally a worst-case scenario, involving full exposure of the glove material to the chemical. A "chemical compatibility chart" is generated as a result (see example).

Glove Materials

Butyl Rubber: good choice for aldehydes, ketones, and esters
Latex: good choice for biological materials
Natural Rubber: resists acids and caustics
Neoprene: wide range of resistance to solvents, acids, caustics, and alcohols
Nitrile: good choice for biological materials, as well as a wide range of applications along with puncture and abrasion resistance
Poly-Vinyl Chloride (PVC): resists acids but not petroleum solvents
Viton: excellent resistance to chlorinated and aromatic solvents

Things to Consider When Choosing a Glove

- What substance(s) will be used?
- How long will you be in contact with a substance (e.g., minutes vs. hours)?
- Will your contact with a substance be intermittent or constant (light vs. heavy exposure)?
- Is dexterity important for your work (thin vs. thick gloves)?

How to Choose the Best Glove

- Review the manufacturer's chemical compatibility chart for specific glove types
- Refer to the attached permeability chart
- Refer to the glove recommendations in your Chemical Hygiene Plan
- Check the Material Safety Data Sheet for the chemical
- Contact your laboratory Safety Officer or your EH&S Office

Some substances do not have a glove that offers a high level of protection. Examples are chloroform and methylene chloride. In the case where glove choices are limited, you may need to wear two pairs of gloves and/or change your gloves frequently.

As always, when performing work in a laboratory environment, be sure to adhere to safe laboratory practices including wearing lab coats, goggles, and gloves at all times, changing gloves frequently, no eating or drinking in the laboratory, and washing hands whenever leaving the area.

If you have any questions, please contact your laboratory Safety Officer or your Environmental Health and Safety Office.