Guidelines for the selection of Chemically Resistant Gloves

All gloves are permeable.

Permeation is a process in which chemicals seep through glove material. This process does not always leave the glove visibly changed, which makes understanding the permeation process essential when selecting gloves.

- Breakthrough is the time lapse between first contact of the chemical and glove and the time to detection inside the glove.
- Degradation may cause such noticeable changes as swelling, discoloration, hardening or softening.

There is no such thing as the "ideal" chemically resistant glove.

Some laminate gloves offer protection against a wide range of hazardous chemicals, there may be limitations in dexterity, tactile sensitivity, ability to grip when wet, tear and puncture resistance.

Disposable gloves offer a decreased range of protection against hazardous chemicals but offer greater dexterity and mobility.

Multiple gloves can be worn together.

Wearing one pair of thinner, more dexterous gloves over a flexible laminate combines the advantage of both. When using this approach, be sure to use the smallest laminate size that will fit comfortably. This allows the greatest dexterity when worn under the outside glove.

Reusable vs. Disposable gloves.

Care of reusable gloves:

Immersion or prolonged contact is not common for chemical work in the laboratory. Therefore, reusable gloves do not need to be replaced very often.
Inspect these types of gloves before each use, and replace whenever they become discoloured or show signs of damage.
Before reusable gloves are removed, thoroughly rinse them off and allow to air dry.

Use of disposable gloves:

Disposable gloves provide a barrier protection when working with small amounts of laboratory chemicals.
If a disposable glove becomes contaminated, remove immediately and replace with a new glove. Never reuse disposable gloves.

Important note regarding latex gloves:

Latex gloves present a risk of irritation, allergic reaction or sensitisation which, for susceptible individuals, can be significant. The latex protein can leach out of the gloves into the user's skin, or into the glove powdering, if powdered gloves are used. This can lead to allergic skin reaction, or a potentially more serious reaction if latex protein-contaminated powder is released into the environment and breathed in.

Glove Selection.

In general terms, the following glove limitations apply:

Glove	Useful for:
Disposable:Vinyl, Latex, Nitrile	Dry Powders, aqueous solutions.
	Do NOT work for constant exposure to solvents/corrosives.
Neoprene (Black)	Corrosives, solvents and alcohols.
Nitrile (Blue or Green)	Organic solvents (non-halogenated), puncture and abrasion resistant
Nomex or Zetex	Temperature extremes (Do NOT use Asbestos gloves)
Butyl	Aldehydes, ketones, and esters
Viton	Chlorinated and aromatic solvents

The following table gives recommended materials for chemically-resistant gloves for work involving a variety of chemicals. Note that this list is not comprehensive and should be used as a guide only.

Abbreviations used for glove material:

4H	4H (PE/EVAL)	Pva	Polvinyl alcohol
B	Barricade	Pvc	Polyvinyl chloride
Br	Butyl rubber	Res	Responder
CPF	CPF 3	S	Saranex
Ne	Neoprene	T	Teflon
Ni	Nitrile rubber	Ty	Tychem 10000
Nr	Natural rubber	V	Viton
Pe	Polyethylene		

Entries in brackets in the table below indicate that the glove material is likely to provide adequate protection for a period of less than four hours, so caution is advised.

4H, Teflon, Viton, Responder, Saranex and Barricade are trade marks.

Chemicals

A

Acetaldehyde	Br T
Acetic acid	Br Ne T V S
Acetone	Br T 4H CPF Res
Acetonitrile	Br T B

Acetonylacetone	Nr Br
Acetophenone	T
Acrolein	Br B
Acrylamide	Br Ni Pvc V
Allylamine	Br
Ammonia (liquid)	Res CPF
Ammonium hydroxide	Br Ni T V
Aniline	
Br Pva T V B	

B

Benzene	Pva T V B
Benzoyl chloride	Pva V
Benzyl alcohol	Br V
Benzylamine	T
Benzyl bromide	T
Boric acid	Br N Ni V
Bromine	T
Bromobenzene	Pva V
2-bromoethanol	Br V
Butyric acid	Br V
γ-butyrolactone	4H

C

Cadmium oxide	Ne Ni
Carbon disulfide	Pva T V B 4H Res Ty
Carbon tetrachloride	Pva T V B
Chloral, anhydrous	V Br
Chloroacetic acid	Br Ne Pe V
4-chloroaniline	B
Chloroform	Pva T V B
1-chloropropane	T
1,8-cineole	T V
Cobalt (III) acetylacetonate	Br Ni
p-cresol	4H
Crystal violet	Br V

D

3,4-dichloroaniline	B
Dichlorobenzene	V
Dichlorodimethylsilane	4H Vi
Dichloromethane	4H Pva Res Ty
Diethyl ether ("ether")	Pva T
Dimethyl acetamide	Br
Dimethylformamide	Br T 4H Res
Dimethyl phosphite	Ne Ni Br
Dimethyl sulfide	Res

Dimethyl sulfoxide (DMSO)	Br Ne T B
2,4-dinitrotoluene	S
1,3-dioxane	Br

E

Ethidium bromide	Ni Br
Ethyl acetate	4H B Res
Ethyl bromide	(Pva, V)
Ethylenediamine	Br T S
Ethylene glycol dimethyl ether	Br
Ethylene oxide	Br T B
Ethyl methacrylate	Br Pva

F

Fluoroacetamide	Ne
Formaldehyde	Br Ni T V B
Formamide	Br Nr
Formic acid	Br Ne Pvc T S B
Furfural	Br Pva S

G

Glutaraldehyde	Br Ne Nr Ni Vi Pvc

H

Heptane	Ni V 4H
Hexane	Ni PVA T V B
Hexachlorobenzene	Res Ty
Hexachloro-1,3-butadiene	Res Ty
Hexachloroethane	Res Ty
1-hexene	T V
Hydochloric acid	Br Nr Ne Ni Pvc T V B
Hydrofluoric acid	Br B T S
Hydrogen bromide	T
Hydrogen peroxide	Br Nr Ni Pe Pvc V

I

Indole	4H Res Ty
Iodine	Pe S
Iodomethane	Br Ni
Isoamyl alcohol (isopentyl alcohol)	Br Ne Ni V
Isobutanol (isobutyl alcohol)	Br Ne Ni V 4H Res
Isopentane	Ni
Isopropanol	Br Ni Vi 4H CPF3 Res

L

Lubricating oil	Nr Ne Ni V

M

Mercuric chloride	B
Mercury	B
Methanesulphonic acid	Ne Pvc
Methanol	Br T V 4H
1-methoxy-2-propanol	Br Ne 4H
Methyl acrylate	Pva T B
Methylamine	Br Ne Ni T V
2-methylbutane	Ni
Methyl tert-butyl ether	Ni PVA 4H B Res
Methylethanolamine	V Br Ne
Methylethyl ketone (MEK)	Br T
Methyl ethyl ketone peroxide (MEKP)	V Ne Br
Methyl glycol (methyl cellosolve)	Br 4H
Methyl isocyanate	Pva B
Methyl mercaptan	B
Methyl trichlorosilane	V
Morpholine	Br

N

Nickel cyanide	Br
Nickel (II) or (III) oxide	Nr Pvc
Nitric acid (concentrated)	Pvc
Nitric acid 30-70%	Br Ne Pe Pvc V S
Nitric acid 30%	Br Nr Ne Ni Pe Pvc T S
Nitric oxide	T
Nitrobenzene	Br Pva T V B

O

Octafluoroadipic acid	Br Nr
Oxalic acid	Br Nr Ne Ni Pvc V

P

2-pentanone	Br
Perchloric acid (ca. 75%)	Nr Ne Ni Pvc T
n-perfluoropentanoic acid	Br Ne Ni Nr
Phenol	Br Ne T V B
Phosgene	T
Phosphorus trichloride	T B
Picric acid	Ne Ni (for short periods, ca. 1hour, only)
Propionaldehyde	Br

Q

Quinoline	Br

S

Sodium cyanide (solid)	Nr Ne Ni Pvc
Sodium fluoride	Nr Ni Ne Pvc
Sodium hydroxide	Br Nr Ne Ni Pe PVC Te Vi Sar Bar 4H Res
Sodium hypochlorite	Br Nr Ni Ne Pe Vi Res
Sodium silicate	Br Nr
Sulfuryl chloride	Br Ni
Sulphuric acid	Br Nr Ne Pe Pvc T V B

T

Tetrahydrofuran (THF)	T B
Toluene	Pva T V
Trichloroacetic acid	Ni
1,1,1-trichloroethane	Pva T V B
1,1,2-trichloroethane	Pva T V
Triethanolamine	Br Nr Ne Ni
Triethylamine	Ni V
Trimethylamine	T

V

Vinyl acetate	T B
4-vinylcyclohexene	Ni V

X

Xylene	Pva T V 4H B

Abridged from:
http://www.orcbs.msu.edu/chemical/glove_guide/guidelines.htm
http://ptcl.chem.ox.ac.uk/MSDS/glovesbymaterial.html
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