

VIII. COMMON SOLVENTS FOR CRYSTALLIZATION

Solvents are listed in approximate order of decreasing polarity. Number refers to entry in table, "Properties of Solvents and Common Liquids," page 2, which can be consulted for further data. In choosing a second solvent for a mixture, trial and error are usually required. However, there are some generally successful mixtures, such as diethyl ether-methanol (or ethanol) for highly associated solids (especially amides, alcohols) and many natural products, and diethyl ether-petroleum ether (or benzene) for polar compounds (especially esters, alcohols) and hydrocarbons.

Solvent	No.	Bp (°C)	Flammability ^a	Toxicity ^a	Good for	Second Solvent for Mixture	Comments ^b
Water	218	100	0	0	Salts, amides, some carboxylic acids	Acetone, alcohols, dioxane, acetonitrile	Precipitates dry slowly
Acetic acid	47	118	+	++	Salts, amides, some carboxylic acids	Water	Difficult to remove; pungent odor
Acetonitrile	40	81.6	+++	+++	Polar compounds	Water, ethyl ether, benzene	
Methanol	23	64.5	+++	+	General, esters, nitro and bromo compounds	Water, ethyl ether, benzene	
Ethanol	55	78.3	+++	0	General, esters, nitro and bromo compounds	Water, hydrocarbons, ethyl acetate	
Acetone	68	56	+++	+	General, nitro and bromo compounds, osazones	Water, hydrocarbons, ethyl ether	Should be dried if not used with water
Methyl cellosolve	79	124	++	++	Sugars	Water, benzene, ethyl ether	
Pyridine	111	115.6	+++	++	High-melting, insoluble compounds	Water, methanol, hydrocarbons	Solvent power depends on dryness; difficult to remove
Methyl acetate	71	57	++++	++	General, esters	Water, ethyl ether	

Ethyl acetate	93	77.1	+++	+	General, esters	Ethyl ether, hydrocarbons, benzene	
Methylene chloride	16	40	0	++	General, low-melting compounds	Ethanol, hydrocarbons	Easily removed and dried
Ethyl ether	101	34.5	++++	++	General, low-melting compounds	Acetone, hydrocarbons	May creep up side of flask and deposit precipitate
Chloroform	12	61.7	0	++++	General, acid chlorides	Ethanol, hydrocarbons	Easily removed and dried
Dioxane	92	102	+++	++	Amides	Water, benzene, hydrocarbons	May form solvates with some ethers
Carbon Tetrachloride	7	76.5	0	++++	Nonpolar compounds, acid chlorides, anhydrides	Ethyl ether, benzene, hydrocarbons	Reacts with some nitrogen bases; cumulative poison
Toluene	159	110.6	+++	++	Aromatics, hydrocarbons	Ethyl ether, ethyl acetate, hydrocarbons	
Benzene	137	80.1	+++	+++	Aromatics, hydrocarbons, molecular complexes	Ethyl ether, ethyl acetate, hydrocarbons	Cumulative poison
Ligroin	-	90-110	+++	+	Hydrocarbons	Ethyl acetate, benzene, methylene chloride	Trace of ethanol sometimes greatly increases solvent power
Petroleum ether (ACS)	-	35-60	++++	+	Hydrocarbons	Any solvent on this list from ethanol down	
n-Pentane	121	36.1	++++	+	Hydrocarbons	Any solvent on this list from ethanol down	
n-Hexane	146	69	++++	+	Hydrocarbons	Any solvent on this list from ethanol down	
Cyclohexane	143	80.7	+++	+	Hydrocarbons	Any solvent on this list from ethanol down	
n-Heptane	170	98.4	+++	+	Hydrocarbons	Any solvent on this list from ethanol down	

^aMore + means more flammable or toxic.

^bComments apply principally to the main solvent, not a possible mixture.