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)	Flamma- bility	Tox- icity	Good for	Second Solvent for Mixture	Comments ^b
Water	218	100	Ö	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	5 +++	+++	Polar compounds	Water, ethyl ether, benzene	
Methanol	23	64.5	5 +++	+	General, esters, nitro and bromo compounds	Water, ethyl ether, benzene	
Ethanol	55	78.3	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	79	124	++	++	Sugars	Water, benzene, ethyl ether	
cellosolve Pyridine	111	115.	6 +++	++	High-melting, insoluble compounds	Water, methanol, hydrocarbons	Solvent power depend on dryness; dif- ficult to remove
Methyl acetate	71	57	++++	++	General, esters	Water, ethyl ether	

Ethyl acetate	93	77.1	+++	+	General, esters	Ethyl ether, hydro- carbons, benzene	
Methylene chloride	16	40	0	++	General, low-melt- ing compounds	Ethanol, hydro- carbons	Easily removed and dried
Ethyl ether	101	34.5	++++	++	General, low-melt- ing compounds	Acetone, hydro- carbons	May creep up side of flask and deposit precipitate
Chloroform	12	61.7	0	++++	General, acid chlorides	Ethanol, hydro- carbons	Easily removed and dried
Dioxane	92	102	+++	++	Amides	Water, benzene, hydrocarbons	May form solvates with some ethers
Carbon Tetra- chloride	7	76.5	0	++++	Nonpolar compounds, acid chlorides, anhydrides	Ethyl ether, benzene, hydro- carbons	Reacts with some nitrogen bases; cumulative poison
Toluene	159	110.6	+++	++	Aromatics, hydro- carbons	Ethyl ether, ethyl acetate, hydro-carbons	
Benzene	137	80.1	+++	+++	Aromatics, hydro- carbons, molec- ular complexes	Ethyl ether, ethyl acetate, hydro-carbons	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 l from ethanol down	ist
n-Pentane	121	36.1	++++	+	Hydrocarbons	Any solvent on this l from ethanol down	ist
n-Hexane	146	69	++++	+	Hydrocarbons	Any solvent on this l from ethanol down	ist
Cyclohexane	143	80.7	+++	+	Hydrocarbons	Any solvent on this 1 from ethanol down	ist
n-Heptane	170	98.4	+++	+	Hydrocarbons	Any solvent on this 1 from ethanol down	ist
	Methylene chloride Ethyl ether Chloroform Dioxane Carbon Tetrachloride Toluene Benzene Ligroin Petroleum ether (ACS) n-Pentane n-Hexane Cyclohexane	chloride Ethyl ether 101 Chloroform 12 Dioxane 92 Carbon Tetra- 7 chloride 159 Benzene 137 Ligroin - Petroleum - ether (ACS) n-Pentane 121 n-Hexane 146 Cyclohexane 143	Methylene chloride Ethyl ether 101 34.5 Chloroform 12 61.7 Dioxane 92 102 Carbon Tetra- 7 76.5 chloride Toluene 159 110.6 Benzene 137 80.1 Ligroin - 90-110 Petroleum - 35-60 ether (ACS) n-Pentane 121 36.1 n-Hexane 146 69 Cyclohexane 143 80.7	Methylene chloride Ethyl ether 101 34.5 ++++ Chloroform 12 61.7 0 Dioxane 92 102 +++ Carbon Tetra- 7 76.5 0 Toluene 159 110.6 +++ Benzene 137 80.1 +++ Ligroin - 90-110 +++ Petroleum - 35-60 ++++ ether (ACS) n-Pentane 121 36.1 ++++ n-Hexane 146 69 ++++ Cyclohexane 143 80.7 +++	Methylene chloride Ethyl ether 101 34.5 ++++ ++ Chloroform 12 61.7 0 ++++ Dioxane 92 102 +++ ++ Carbon Tetra- 7 76.5 0 ++++ Toluene 159 110.6 +++ ++ Benzene 137 80.1 +++ +++ Ligroin - 90-110 +++ + Petroleum ether (ACS) n-Pentane 121 36.1 ++++ + n-Hexane 146 69 ++++ + Cyclohexane 143 80.7 +++ +	Methylene chloride 16 40 0 ++ General, low-melting compounds Ethyl ether 101 34.5 ++++ ++ General, low-melting compounds Chloroform 12 61.7 0 ++++ General, acid chlorides Dioxane 92 102 +++ ++ Amides Carbon Tetrachan 7 76.5 0 ++++ Nonpolar compounds, acid chlorides, anhydrides Toluene 159 110.6 +++ ++ Aromatics, hydrocarbons Benzene 137 80.1 +++ +++ Aromatics, hydrocarbons, molecular complexes Ligroin - 90-110 +++ + Hydrocarbons Petroleum ether (ACS) - 35-60 ++++ + Hydrocarbons n-Pentane 121 36.1 ++++ + Hydrocarbons Cyclohexane 143 80.7 +++ + Hydrocarbons	Methylene 16 40 0 ++ General, low-melting compounds carbons Ethyl ether 101 34.5 ++++ ++ General, low-melting compounds Ethyl ether 101 34.5 ++++ ++ General, low-melting compounds Chloroform 12 61.7 0 ++++ General, acid chlorides carbons Dioxane 92 102 +++ ++ Amides Water, benzene, hydrocarbons Carbon Tetra-chloride 7 76.5 0 ++++ Nonpolar compounds, acid chlorides, anhydrides Toluene 159 110.6 +++ ++ Aromatics, hydrocarbons Benzene 137 80.1 +++ ++ Aromatics, hydrocarbons, molecular complexes Ligroin - 90-110 +++ + Hydrocarbons Ethyl ether, ethyl acetate, hydrocarbons Petroleum - 35-60 ++++ + Hydrocarbons Any solvent on this 1 from ethanol down n-Hexane 146 69 ++++ + Hydrocarbons Any solvent on this 1 from ethanol down n-Heptane 170 98.4 +++ + Hydrocarbons Any solvent on this 1 from ethanol down n-Heptane 170 98.4 +++ + Hydrocarbons Any solvent on this 1 from ethanol down Any solvent on this 1 from ethano

^aMore + means more flammable or toxic.

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