

TABLE 5.2 Molecular polarizabilities as determined from molecular or bulk properties^{a,b}

Molecule		Polarizabilities deduced from gas (molecular) properties			Polarizabilities from condensed phase (continuum) properties					
		u_{gas} meas. (D) ^c	$\frac{\alpha_e}{(4\pi\epsilon_0)}$ measured (10 ⁻³⁰ m ³)	$\frac{\alpha}{(4\pi\epsilon_0)}$ calculated from $\alpha = \alpha_0 + \frac{u^2}{3kT}$ (10 ⁻³⁰ m ³)	M (10 ³ kg mol ⁻¹)	ρ (10 ³ kg m ⁻³)	n	ϵ	$\frac{\alpha_0}{(4\pi\epsilon_0)}$ from	$\frac{\alpha}{(4\pi\epsilon_0)}$ from
									$\left(\frac{n^2 - 1}{n^2 + 2}\right) \frac{3M}{4\pi N_0 \rho}$ (10 ⁻³⁰ m ³)	$\left(\frac{\epsilon - 1}{\epsilon + 2}\right) \frac{3M}{4\pi N_0 \rho}$ (10 ⁻³⁰ m ³)
CCl ₄	Carbon tetrachloride	0	10.5	10.5	153.8	1.59	1.460	2.2	10.5	11.2
C ₆ H ₆	Benzene	0	10.3	10.3	78.1	0.88	1.601	2.3	10.4	10.5
CHCl ₃	Chloroform	1.06	8.2	17.5 (20°C) 21.1 (-63°C)	119.4	1.48	1.446	4.8 (20°C) 6.8 (-63°C)	8.5	17.9 (20°C) 21.1 (-63°C)
H ₂ O	Water	1.85	1.5	29.7	18.0	1.00	1.333	80	1.5	6.9
(CH ₃) ₂ CO	Acetone	2.85	6.4	73.4	58.1	0.79	1.359	21	6.4	25.3
CH ₃ OH	Methanol	1.69	3.2	26.8	32.0	0.79	1.329	33	3.3	14.7
C ₂ H ₅ OH	Ethanol	1.69	5.2	28.8	46.1	0.79	1.361	26	5.1	20.7
n-C ₆ H ₁₃ OH	Hexanol	1.69	12.5	36.1	102.2	0.81	1.418	13	12.6	40.0
C ₆ H ₅ OH	Phenol	1.45	11.2	26.4	94.1	1.07	1.551	10 (60°)	11.1	26.1

^a All values at 20°C unless stated otherwise.

^b α_0 , electronic polarizability; α , total polarizability.

^c 1 D = 3.336 × 10⁻³⁰ C m.