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Sedimentation Coefficients, Diffusion Coefficients, Partial Specific Volumes, Frictional Ratios, and Second Virial Coefficients of Polymers in Solution*,**

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A. SEDIMENTATION COEFFICIENTS, DIFFUSION COEFFICIENTS, PARTIAL SPECIFIC VOLUMES, AND FRICTIONAL RATIOS OF POLYMERS IN SOLUTION

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1. Introduction

1.1. Sedimentation Coefficient The sedimentation coefficient s is defined as the sedimentation velocity in a unit force field

$$s = (\mathrm{d}r/\mathrm{d}t)/(\omega^2 r) \tag{A1}$$

where r is the distance from center of rotation, and ω, the angular velocity. For a given polymer–solvent system, the sedimentation coefficient is dependent on temperature T, pressure p, and polymer concentration C. Experimentally, sedimentation coefficients can be determined only with an ultracentrifuge.

Concentration Dependence

For polymer solutions studied by ultracentrifugation, the following concentration dependence of the sedimentation coefficient holds:

$$1/s = (1/s_0)(1 + k_s C + k_s' C^2 + \cdots) \tag{A2}$$

where s_0 is the sedimentation coefficient at zero concentration. In Section B the concentration dependence of s according to Eq. (A2) is listed. In some cases, special extrapolation procedures are used. The tables in Section B also refer to the appropriate reference. For special treatments, see, e.g., Gehatia (358,359).

Sector shaped cells are normally used in an ultracentrifuge. In these cells, the square-dilution rule has to be taken into account (360):

$$C_t/C_0 = (r_0/r_t)^2 \tag{A3}$$

where r_0 and r_t are the distances of the meniscus and of the boundary from the axis of rotation and C_0 and C_t the concentrations at zero time and at time t at the boundary, respectively.

Averages of the Sedimentation Coefficient

The average of a function $X(M)$ is defined as

$$X_\beta = \left(\int_0^\infty W(M) M^{\beta-1} X(M)\,\mathrm{d}M\right) \Big/ \left(\int_0^\infty W(M) M^{\beta-1}\,\mathrm{d}M\right) \tag{A4}$$

with $\int_0^\infty W(M)\,\mathrm{d}M = 1$, where $W(M)$ denotes the probability density function (in our case the molar mass distribution). The average with $\beta = 0$ is called the number average X_n, with $\beta = 1$, the mass average X_w, and with $\beta = 2$, the z-average X_z.

In principle it is possible to evaluate the various averages of the sedimentation coefficient from the distribution of the concentration gradient, $\partial C/\partial r$, in the cell:

$$s_n = M_n \int_0^\infty W(M) M^{-1} s(M)\,\mathrm{d}M$$

$$s_w = \int_0^\infty W(M) s(M)\,\mathrm{d}M$$

$$s_z = (1/M_w) \int_0^\infty W(M) M s(M)\,\mathrm{d}M \tag{A5}$$

where $W(M) = C(M)/\int_0^\infty C(M)\,\mathrm{d}M = C(M)/C_0$ is the mass distribution of the polydisperse polymer in the cell and s_n, s_w, and s_z the number average, mass average and z-average of the sedimentation coefficient. In many cases the migration of the maximum of the quantity $\partial C/\partial r$ is determined, which leads to a sedimentation coefficient s_t, that in turn is related, in a complicated manner, to the averages of s in Eq. (A5). Another method of evaluating the sedimentation coefficient is by observing the median, that is the line dividing the gradient curve in two equal areas, yielding a value s_m which is also a rather complicated average. Provided the skewness of the molar mass distribution is not very pronounced, s_w can be calculated by (Ref. 259)

$$s_w = (3s_m - s_t)/2 \tag{A6}$$

Most ultracentrifuges measure the refractive index difference between polymer and solvent, $\mathrm{d}n$, or the refractive index gradient $\partial n/\partial r$ versus r (Schlieren optics). With certain assumptions $\partial n/\partial r$ can be related to the concentration gradient (Ref. 14)

$$\partial n/\partial r = R(\partial C/\partial r) \tag{A7}$$

where R is called the specific refractive index increment. The interference optics measure the deflection of the parallel interference lines in the solution. This deflection is directly proportional to the concentration of the polymer.

The absorption optics measure the optical density of the system as a function of the rotor distance, which, according to the Lambert–Beers law is proportional to the concentration of the polymer. The intensity is measured with a photoelectric scanner.

A multiplexer is used in order to measure several concentrations during one run (869–871).

Sedimentation Coefficient – Molar Mass Relationship
The dependence of s on the molar mass can be given by a power law expression:

$$s = K_s M^{a_s} \tag{A8}$$

where K_s and a_s are empirical constants determined for each polymer–solvent system at given values of temperature and pressure. In Section B, relationship (A8) is listed whenever quoted in the literature, in preference to single s values.

Temperature Dependence, Pressure Dependence
Svedberg and Pedersen (2) and Mosimann and Signer (361) derived expressions for the temperature and pressure dependence of the sedimentation coefficient with restricted validity:

$$s/s^\theta = (\eta_1^\theta/\eta_1)\,(1 - v_2^\theta \rho_1^\theta)/(1 - v_2\rho_1) \tag{A9}$$

where s^θ, η_1^θ, v_2^θ and ρ_1^θ denotes the values at the reference temperature and/or pressure. Equation (A9) holds in the case of an incompressible medium and if no changes of size, shape and solvation state of the dissolved molecules in the temperature and pressure region take place. From these assumptions it may be deduced that Eq. (A9) can be applied with sufficient accuracy only on proteins in aqueous solvents.

Due to the high centrifugal fields applied in the ultracentrifuge, pressure gradients with pressures up to 200 bars are encountered in the cell and change appreciably the viscosity and the density of the solvent and the partial specific volume of the polymer. Thus the sedimentation coefficient, s, measured at a pressure p differs from the sedimentation coefficient, s^0, measured at 0 bar. Application of Eq. (A9) for the calculation of s requires the knowledge of η_1 (362), ρ_1 (given in a number of Handbooks) and v_2 (148). More precise equations for the calculation of the pressure influence on the sedimentation have been worked out by several authors (363,364,365,800). The equation of Oth and Desreux (Ref. 363)

$$s = s^0(1 - \mu p) \tag{A10}$$

has very often been used for the calculation of s^0 (800). The coefficient μ depends on the polymer–solvent system and varies only slightly with pressure.

In Section B, the intrinsic sedimentation coefficient, $[s^0]$, instead of s^0, has been occasionally listed. $[s^0]$ is related to Eq. (9): $[s_0] = s_0\eta_1/(1 - v_2\rho_1)$.

1.2. Diffusion Coefficient The translational diffusion coefficient D is defined by Ficks' first law:

$$J = -D\nabla C \tag{A11}$$

where J is the flow of substance (total number of particles transported in unit time across unit surface) and ∇C the concentration gradient. For one dimensional diffusion, Eq. (A11) reduces to

$$(1/A)\,(\partial n/\partial t) = -D(\partial C/\partial r) \tag{A12}$$

where A denotes the area and n the number of moles. The negative sign in Eqs. (A11) and (A12) indicate that diffusion takes place in the direction of decreasing concentration. For practical reasons, Ficks second law is prefered

$$(\partial C/\partial t) = D\Delta C \tag{A13}$$

where Δ denotes the Laplace operator. Eq. (A13) reduces to

$$(\partial C/\partial t) = D(\partial^2 C/\partial r^2) \tag{A14}$$

for the one dimensional case. Eqs. (A13) and (A14) allow the determination of D when solved with consideration to certain initial and boundary conditions.

Experimentally translational diffusion coefficients can be determined with an ultracentrifuge (see Section 1.3) in special diffusion cells using Eqs. (A11)–(A14) (800) and with dynamic light scattering (DLS). Since 1970, when the dynamic light scattering became available, nearly all diffusion coefficients have been measured by this method. Based on the theory of Pecora (853,854), the experimentally measured autocorrelation function $g_2(t)$ is linked with the diffusion coefficient in polymer solutions (Refs. 730,855):

$$\lim_{c\to 0} g_2(t) = A + B\left(M_w^{-1}\int_0^\infty MW(M)p(q,M)\exp(-q^2D(M)t)\mathrm{d}M\right)^n \tag{A15}$$

where $n = 1$ for the heterodyne procedure and $n = 2$ for the homodyne one. Eq. (A15) reduces, in the case of a monodisperse polymer solution, to

$$\lim_{c\to 0} g_2(t) = A + B(p(q,M)\exp(-q^2D(M)t))^n \tag{A16}$$

A and B are measurable constants. Extrapolation of q against zero yields $P(q,M) = 1$. Note that $g_2(t)$ is the z-average of the function, $\exp(-q_2 D(M)t)$. In this way one obtains the direct measurable quantity D_z from dynamic light scattering on polydisperse polymer solutions.

For polydisperse polymer solutions, Eq. (A16) may be expanded in a series (Ref. 856):

$$\lim_{\substack{C\to 0\\ q\to 0}} g(t) = \exp(-q^2 D_z t)\,(1 + (\mu_2/2!)t^2 - (\mu_3/3!)t^3 + \cdots) \tag{A17}$$

where the moments, μ_i, are related to the molar mass distribution of the polymer (671).

More general methods for the determination of the distribution of the diffusion coefficient and of the molar mass are given elsewhere (857,858).

As has been pointed out, only the translational diffusion coefficient is listed in the tables. For higher modes of the autocorrelation function (e.g. rotation, vibration) see the appropriate literature (853,854).

The entire description of the translational diffusion of a polymer molecule in solution requires the determination of the mutual or cooperative diffusion coefficient, D_m, which characterizes the relaxation of a concentration gradient and the self-diffusion coefficient, D_s, which describes the Brownian or random motions of the polymer molecule (860–863).

$$D_m = (RT/f)\,(1 - v_2\rho_1)\,(1 + 2A_2MC + 3A_3MC^2 + \cdots)$$
$$D_s = RT/f$$

At infinite dilution, $D_m = D_s \times D_m$ is normally measured with classical diffusion cells or dynamic light scattering whereas D_s can be studied by measuring the migration of labeled solute molecules (864), by pulsed field gradient NMR (865), and by forced Rayleigh scattering (866). Normally, D_m is given in the tables. In some cases, especially where D_s is extrapolated to zero concentration, $D_s = D_m$ is given in the tables.

Concentration Dependence

The concentration dependence of the diffusion coefficient may be described as

$$D = D_0(1 + k_D C + k'_D C^2 + \cdots) \tag{A18}$$

where D_0 is the diffusion coefficient at zero concentration. In Section B a concentration dependence of D according to Eq. (A18) is listed. In some cases, special extrapolation procedures are used. In these cases Section B refers to the appropriate references.

Averages of the Diffusion Coefficient

Similar considerations as made on sedimentation coefficients hold for diffusion coefficients. From measurements in a diffusion cell, one obtains the various averages of the diffusion coefficient from the distribution of the concentration gradient, $\partial C/\partial r$, in the cell:

$$D_n = M_n \int_0^\infty W(M)M^{-1}D(M)\,dM$$
$$D_w = \int_0^\infty W(M)D(M)\,dM$$
$$D_z = (1/M_w)\int_0^\infty W(M)MD(M)\,dM \tag{A19}$$

where $W(M) = C(M)/C_0$.

The diffusion cell may be combined in the same manner as in the case of the ultracentrifuge with Schlieren optics, interference optics, and absorbtion optics. In most cases, the mass average and the area average of the diffusion coefficient are determined. They can be calculated with the help of Eqs. (A14) and (A19):

$$D_w = \left(\int_0^\infty r^2(\partial C/\partial r)\,dr\right) \Big/ \left(2t\int_0^\infty (\partial C/\partial r)\,dr\right) \tag{A20}$$

$$D_A = \int_0^\infty ((\partial C/\partial r)\,dr)^2/(4\pi t(\partial C/\partial r)_{max})^2 \tag{A21}$$

$(\partial C/\partial r)_{max}$ is the maximum height of $\partial C/\partial r$. The integral in Eq. (A21) is the area of the curve.

As has been pointed out, dynamic light scattering measurements normally yield the z-average of D. Nevertheless it might be possible to determine averages other than D_z with the help of Eqs. (A19) and (A21). In Section B the different averages of D are quoted. In some cases unusual averages are listed. In these cases Section B refers to the appropriate references.

Diffusion Coefficient – Molar Mass Relationship

The diffusion coefficient – molar mass dependence frequently takes the form

$$D = K_D M^{-a_D} \tag{A22}$$

where K_D and a_D are constants for each polymer–solvent system at given values of temperature and pressure. In Section B relationship A(22) is listed whenever quoted in the literature, in preference to single D values.

Temperature Dependence, Pressure Dependence

A similar expression as Eq. (A9) holds under the same restricted conditions for the temperature and pressure dependence of the diffusion coefficient:

$$(D/T)/(D^\theta/T_0) = \eta_1^\theta/\eta_1 \tag{A23}$$

where D^θ and η_1^θ denote the values at the reference temperature T_0 and/or pressure p_0. As has been pointed out in Eq. (A9), Eq. (A23) can be applied with sufficient accuracy on proteins in aqueous solvents only.

The temperature dependence of the diffusion coefficient is often described by the following exponential function

$$D = D_\infty \exp(-E_D/RT) \tag{A24}$$

where E_D denotes the apparent activation energy of the diffusion and D_∞ the diffusion coefficient at the limit $T = \infty$. In Section B we have listed the temperature and pressure dependence of D whenever quoted in the literature.

1.3. Molar Mass Averages Determined from Sedimentation and Diffusion Coefficients For the experimental determination of the molar mass from sedimentation and diffusion measurements, the Svedberg Eq. (A2) is used:

$$M = (s_0/(1/v_2\rho_1))/(D_0/RT) \tag{A25}$$

Here s_0 and D_0 are the corrected and standardized coefficients for zero polymer concentration. For polydisperse polymers the various averages of the sedimentation and diffusion coefficient s and D are inserted, obtaining certain molar mass averages $M_{\beta,\gamma}$. Thus Eq. (A25) acquires the more general form:

$$M_{\beta,\gamma} = (s_{0,\beta}/(1 - v_2\rho_1))/(D_{0,\gamma}/RT) \tag{A26}$$

For β = n, w, z, ... and γ = n, w, z, ... Eq. (A26) defines several different molar mass averages $M_{n,n}$, $M_{w,n}$, $M_{w,w}$ etc. The averages, $M_{n,n}$, and $M_{w,w}$, are different from M_n and M_w respectively (859). The coefficients with β = n and z and γ = n are determinable only with large error. Instead, the coefficients with $\beta = t$ and m (see under Section 1.1.) and γ = A and w (see under Section 1.2.) are usually evaluated. Thus, rather peculiar averages, e.g. $M_{t,A}$, $M_{m,w}$, and $M_{m,A}$, result. The more straightforward molar mass averages $M_{n,w}$, $M_{w,w}$, $M_{z,w}$, etc., in relation to the familiar averages, M_n, M_w, and M_z, are found elsewhere in the literature (369–371,859).

1.4. Partial Specific Volumes The volume, V^{id}, of an ideal two component system can be expressed in terms of the masses m_1 and m_2 and the specific volumes, v_1^0 and v_2^0, of the two components by the equation

$$V^{id} = m_1 v_1^0 + m_2 v_2^0 \tag{A27}$$

Most components do not behave ideally upon mixing; i.e. they react with each other in a way so that the total volume deviates from V^{id}. The total volume can then be written as

$$V = m_1 v_1 + m_2 v_2; \quad v_i = (\partial V/\partial m_i)_{p,T,m_{j\neq i}} \tag{A28}$$

where v_i ($i = 1, 2$) is the partial specific volume of component i. When component 2 is polymer and component 1 solvent, then, for practical reasons it is convenient to introduce the so-called apparent partial specific volume v_2^* which is defined by

$$V = m_1 v_1^0 + m_2 v_2^* \tag{A29}$$

where v_1^0 denotes the specific volume of the solvent. The quantity, v_2^*, now contains the parameter of nonideal mixing of both the solvent and the polymer. In practice, however v_2^* differs not much from v_2 if the polymer concentration is kept low (up to 1%). Dividing Eq. (A29) by the total mass $m_1 + m_2$ leads to

$$v = w_1 v_1^0 + w_2 v_2^* \tag{A30}$$

where v is the specific volume of the solution and $w_i = m_i/\sum m_i$ are the mass fractions of the solvent ($i = 1$) and the polymer ($i = 2$).

With $v = 1/\rho$ and $v_1^0 = 1/\rho_1$, ρ and ρ_1 being the densities of the solution and the solvent, respectively, it is readily found that

$$v_2^* = (1/w_2)(\rho_1 - w_1\rho)/(\rho\rho_1) \tag{A31}$$

Eq. (A31) demonstrates that v_2^* can be determined by measuring ρ_1 and ρ. Numerous methods for determining densities are described in the literature (268,372–379).

In order to determine the partial specific volume from the apparent specific volume, Eq. (A29) yields

$$(\partial(m_2 v_2^*)/\partial m_2)_{m_1} = m_2(\partial v_2^*/\partial m_2)_{m_1} + v_2^* = (\partial V/\partial m_2)_{m_1} \tag{A32}$$

where $(\partial V/\partial m_2)_{m_1}$ is, according to definition, equal to v_2. In terms of mass fractions, Eq. (A32) can finally be written as

$$v_2 = v_2^* + w_1 w_2(\partial v_2^*/\partial w_2) \tag{A33}$$

Most values reported in the literature are v_2^*-values rather than v_2-values, since extrapolation according to Eq. (A33) is usually omitted. The differences between v_2^* and v_2 are, however, often small.

1.5. Frictional Ratios The molar frictional coefficient, f_{sp}, of an unsolvated spherical molecule may be computed by the formula based on Stokes law:

$$f_{sp} = 6\pi\eta R_H N_A = 6\pi\eta[3N_A M v_2/(4\pi)]^{1/3} \tag{A34}$$

where η is the viscosity of the solvent and N_A is Avogadro's number. When the shape of a molecule deviates from a sphere, or when it is solvated, then the frictional coefficient, f_0, of such a molecule is larger than that of the spherical molecule. The frictional ratio, f_0/f_{sp}, thus permits to draw conclusions concerning either solvation or shape of the

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molecule. It is possible to calculate the dimensions of the nonspherical molecule, provided a particular model (ellipsoid, cylinder, etc.) for the molecule is adopted and either the degree of solvation is known or assumed to be negligible. The molar frictional coefficient can be determined either from sedimentation velocity data, provided the molar mass is known from independent measurements according to the Svedberg equation

$$f_0 s_0 = M(1 - v_2\rho_1) \qquad \text{(A35)}$$

or from diffusion measurements, using the relation

$$f_0 = RT/D_0 \qquad \text{(A36)}$$

Eqs. (A34)–(A36) are most frequently used for calculating the frictional ratio. f_0/f_{sp} is listed in the tables. Other relationships for the determination of f_0/f_{sp} are quoted in the literature (2). In these cases special reference to the literature is made in the tables.

In few cases, only the molar frictional coefficient f_0, rather than f_0/f_{sp}, was quoted in the literature. These values are inserted in the same column as the values for the frictional ratio.

1.6. List of Symbols and Abbreviations

Symbols

C	Concentration
C_0	Initial polymer concentration
C_t	Polymer concentration at time t
D	Diffusion coefficient
D_A	Area average of the diffusion coefficient
D_n, D_w, D_z	Number average, mass average, and z-average of the diffusion coefficient
D	Diffusion coefficient at reference temperature and/or pressure
D_0	Diffusion coefficient at zero concentration
η_1	Viscosity of solvent
η_1^θ	Viscosity of solvent at reference temperature and/or pressure
f_{sp}	Molar frictional coefficient of a spherical molecule
f_0	Molar frictional coefficient at zero concentration
k_s, k_s	Concentration coefficients defined by Eq. (A2)
k_D, k_D	Concentration coefficients defined by Eq. (A18)
M	Molar mass of the polymer
M_n, M_w, M_z	Number average, mass average and z-average of the molar mass of the polymer
M	Molar mass determined by Mark–Houwink equation
M_{MW}	Molar mass determined by equations from Mandelkern and Flory, or Wales and Van Holde (see Section 1.7)
$M_{\beta,\gamma}$	Molar mass average determined by Eq. (A26) from $s_{0,\beta}$ and $D_{0,\gamma}$
$M_{s,w}$, $M_{s,A}$, $M_{s,D}$	Molar mass average determined from undefined sedimentation coefficient s and D_w, D_A and undefined diffusion coefficient D, respectively
n	Refractive index or number of moles
ω	Angular velocity
r	Distance from center of rotation
r_0	Distance of meniscus from center of rotation
r_t	Distance of boundary from center of rotation at time t
ρ	Density of solution
ρ_1	Density of the solvent
R	Gas constant
s	Sedimentation coefficient
s_n, s_w, s_z	Number average, mass average, and z-average of the sedimentation coefficient
s_θ	Sedimentation coefficient at reference temperature and/or pressure
s^0	Sedimentation coefficient at pressure $p = 0$ bar
s_0	Sedimentation coefficient at zero concentration
$[s_0]$	Intrinsic sedimentation coefficient (see under Section 1.1)
s_m	Sedimentation coefficient determined from migration of gradient curve median
s_t	Sedimentation coefficient determined from migration of gradient curve maximum
T	Temperature
θ	Theta temperature ($A_2 = 0$)
t	Time
v_i	Partial specific volume of component i ($i = 1$, solvent; $i = 2$, solute)
v_1^0	Specific volume of component i
v_2^*	Apparent specific volume of solute

Abbreviations

A	Archibald method
approx.	approximately
CLS	Classical light scattering method
DLS	Dynamic light scattering method
NBS	National Bureau of Standards, USA (now National Institute of Standard and Technology, NIST)
OS	Osmometry
PCC	Pressure Chemical Co., Pittsburg, PA, USA
RT	Room temperature
SE	Sedimentation equilibrium
SRM	Standard reference material
SV	Sedimentation velocity
TS	Toyo Soda Co., Japan
V	Number of single values given in Ref. cited

1.7. Miscellaneous With certain assumptions it is possible to determine the molar mass from a combination of the intrinsic viscosity $[\eta]$ and the limiting sedimentation coefficient s_0. In this way, Mandelkern and Flory (128) and Wales and Van Holde (134) derived an expression. An expression similar to the equation between M, $[\eta]$, and s_0 was derived between M, $[\eta]$, and D_0 (128). The molar masses determined from either one of these relationships are refered to as MW.

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B. TABLES OF SEDIMENTATION COEFFICIENTS, DIFFUSION COEFFICIENTS, PARTIAL SPECIFIC VOLUMES, AND FRICTIONAL RATIOS OF POLYMERS IN SOLUTION

TABLE 1. POLY(ALKENES)

Polymer	Solvent	T (°C)	M ($\times 10^{-3}$) (g/mol)	s_0 ($\times 10^{13}$) (s)	k_s (cm^3/g)	D_0 ($\times 10^7$) (cm^2/s)	k_D (cm^3/g)	f_0/f_{sp}	v_2 (cm^3/g)	Remarks	Refs.
Poly(ethylene)	1-Bromonaphthalene	110	4.7	1.42						M_v	38
			14.2	2.03							
			21.8	2.39							
			55.0	3.39							
linear	1-Bromonaphthalene	110	3.5–274	$s_0 = 7.74 \times 10^{-15}\ M^{0.344}$						M_v	38
		120	69	−4.09						M_{MW}	509
			136	−5.14							
branched		120	88	−5.18						M_{MW}	509
linear	1-Chloronaphthalene	120		−1.67						$[\eta] = 51$ cm^3/g	27
				−2.37						90	
				−3.31						169	
branched, fractions branches per molec.											
1.9				−1.06						$[\eta] = 18$ cm^3/g	27
2.6				−1.91						33	
3.0				−2.85						56	
2.9				−2.77						60	
4.6				−3.57						66	
5.7				−4.11						74	
6.4				−4.52						88	
13.7				−7.30						118	
16.1				−7.87						129	
26.3				−11.37						139	
		110							[a]		532
	Diphenyl	123							[a]		
		130	26			9.80				D_A, M_w, D_w given in Ref.	593
			60			6.42					
			79			6.42					
			99			4.73					
			261			3.13					
			493			2.15					
branched	Tetralin	80	25.7			0.87				$D_{0,z}$; $M_w/M_n \cong 3$	619
			503			0.20				$D_{0,z}$; $M_w/M_n \cong 5$	
Poly(1-butene)	Ethyl octanoate	22 ($T = \theta$)	800	1.30	55.5				1.106[b]	M_{MW};	409,410
Poly(isobutene)	Cyclohexane	34 ($T = \theta$)		6.4[c]	721 ± 159					M_v; Oppanol B 100	576
									1.091	M_n	32,621,622
		20	30.9	0.925	54						
			86.7	1.49	128						
			172	1.94	191						
			672	3.33	510						

			1420	4.45	836				
		25	21			6.32	4.8		M_w; $M_w/M_n = 3.2$ 620
			78			2.99	41		M_w; $M_w/M_n = 2.1$
			122			2.26	53		M_w; $M_w/M_n = 2.0$
			176			1.84	79		M_w; $M_w/M_n = 2.7$
			490			1.01	167		M_w; $M_w/M_n = 4.5$
			698			0.79	379		M_w; $M_w/M_n = 5.1$
			1800			0.43	348		M_w; $M_w/M_n = 10.8$
	Ethyloctanoate	22	750	1.3	55.5			1.106	s_t 237
	n-Heptane	25	145						M_w; C from 0.53 to 2.95 g/dm^3; M_n, D_A given in Ref. 511
		25	65.2–308			$D_0 = 5.01 \times 10^4\ M^{0.555}$			M_w; CLS 449
	Octane	20.9	52					1.072	M 148
		23.2	1600					1.069	
		20.7	1600					1.075	
		25	1900	5.8					M_w, s^0, $C = 3.461$ g/dm^3; 25V; C from 3.461 to 16.293 g/dm$_3$ p from 0 to 46×10^5 Pa 623
	Tetralin	24	388			0.68			Oppanol B 50; $M_w/M_n = 3.0$ 624
	Toluene	24	388			2.7			Oppanol B 50; $M_w/M_n = 3.0$ 624
Poly(isobutylene)	Benzene	24.5				$D_0 = 1.27 \times 10^{-8}\ M_w^{-0.48}$;			$M_w/M_n = 1.2$ 989
	Chloroform	25				$D_0 = 6.22 \times 10^{-8}\ M_w^{-0.60}$			$M_w/M_n = 1.2$
	Cyclohexane	25				$D_0 = 1.78 \times 10^{-4}\ M_w^{-0.572}$	CLS and DLS		990
						$1.33 \times 10^5 \le M_w \le 14.8 \times 10^5$ g/mol			
	Isoamyl isovalerate (IAIV)	25 ($T = \theta$)	18.1			5.1	−8.7		$M_w/M_n = 1.08$ 1050
			48.5			3.1	−16		$M_w/M_n = 1.06$
			139			1.9	−24		$M_w/M_n = 1.07$
			422			1.1	−47		$M_w/M_n = 1.09$
			634			0.86	−64		$M_w/M_n = 1.06$
			819			0.75	−80		$M_w/M_n = 1.09$
			1760			0.52	−110		$M_w/M_n = 1.09$
	n-Heptane	25	18.1			16.3	−1.5		M_w 1050
			48.5			9.5	3.5		M_w
			139			5.5	13		M_w
			422			2.8	56		M_w
			634			2.3	68		M_w
			819			2.0	88		M_w
			1760			1.3	180		M_w
		25				$D_0 = 4.10 \times 10^{-4}\ M_w^{-0.560}$;			CLS and DLS 990
						$0.64 \times 10^5 \le M_w \le 14.8 \times 10^5$ g/mol			
	Isoamyl isovalerate (IAIV)	22.1				$D_0 = 5.94 \times 10^{-5}\ M_w^{-0.493}$;			CLS and DLS 990
						$0.64 \times 10^5 \le M_w \le 14.8 \times 10^5$ g/mol			
		25 ($T = \theta$)	420			1.06			$[\eta] = 70.9$ cm^3/g 1051
			634			0.86			$[\eta] = 88.2$ cm^3/g
			819			0.75			$[\eta] = 99.8$ cm^3/g
			1760						$[\eta] = 146$ cm^3/g

TABLE 1. *cont'd*

Polymer	Solvent	T (°C)	M ($\times 10^{-3}$) (g/mol)	s_0 ($\times 10^{13}$) (s)	k_s (cm^3/g)	D_0 ($\times 10^7$) (cm^2/s)	k_D (cm^3/g)	f_0/f_{sp}	v_2 (cm^3/g)	Remarks	Refs.
Poly(1-hexene)	Acetone	20	46.8	11.5		16.2				s_1; D_A; $M_{1,A}$	53
			222	21.5		6.4					
			571	33.8		3.0					
		20							0.793		54
Poly(tetrafluoroethylene)	Perfluorotetracosane	325	260			3.66	−35.2				1004
			2100			1.21	−130.0				

[a] See Ref.for various methods applied and values obtained.
[b] Corrected for pressure influence.
[c] See Ref. for def. of s.

TABLE 2. POLY(DIENES)

Polymer	Solvent	T (°C)	M ($\times 10^{-3}$) (g/mol)	s_0 ($\times 10^{13}$) (s)	k_s (cm^3/g)	D_0 ($\times 10^7$) (cm^2/s)	k_D (cm^3/g)	f_0/f_{sp}	v_2 (cm^3/g)	Remarks	Refs.
Poly(butadiene)	Diethyl ketone	10.3	60	1.76						M_{MW}	590
			187	2.76							
			350	3.45							
			436	4.28							
			778	4.52							
			1380	5.15							
cis-4	Dodecane	80				23.8					625
cis-4	Hexafluorobenzene	80				16.3					625
95%, 1,4 *cis*	Diethylketone	10.3 ($T=\theta$)		$s_0 = 0.53 \times 10^{-15}\ M^{0.5}$						s_n, s_w, s_1, $s_{m,0}$ given in Ref.	574
90%, 1,4 *cis* (TiJ_4)	Hexane/heptane (1/1)	20	55–1080	$s_0 = 2.80 \times 10^{-15}\ M^{0.48}$						$M_{s,D}$	323
90%, 1,4 *cis* ($CoCl_2$)	Hexane/heptane (1/1)		34.7–1040	$s_0 = 2.33 \times 10^{-15}\ M^{0.50}$						$M_{s,D}$	323
cis-4	Hexatriacontan	80				4.78					625
linear	Cyclohexane	25				$D_0 = 1.45 \times 10^{-4}\ M_w^{-0.561}$; $11000 \le M_w \le 760000$ g/mol					987
	Dioxane	26.5 ($T=\theta$)				$D_0 = 6.34 \times 10^{-5}\ M_w^{-0.496}$; $11000 \le M_w \le 760000$ g/mol					
18-armed star	Cyclohexane	25				$D_0 = 2.39 \times 10^{-4}\ M_w^{-0570}$; $99000 \le M_w \le 1900000$ g/mol					
	Dioxane	26.5 ($T=\theta$)				$D_0 = 8.87 \times 10^{-5}\ M_w^{-0.497}$; $99000 \le M_w \le 1900000$ g/mol					
Poly(butadiene-*stat*-acrylonitrile)	Methyl ethyl ketone/ cyclohexane (47.5/52.5)	22 ($T=\theta$)	34.8–780	$s_0 = 1.28 \times 10^{-2}\ M^{0.5}$		$D_0 = 1.38 \times 10^{-4}\ M^{-0.5}$;				D_A; $M_{s,D}$, k_s given in Ref.	552
	Methyl ethyl ketone/ isopropanol (60/40)	20 ($T=\theta$)	475	7.58	19.7					D_A; $M_{s,D}$	552
			205	4.65	16.0						
			101	3.43	20.6						
Poly(butadiene-*co*-styrene)											
branched	Benzene	25	81.9–168	1.21–4.63				0.995 ± 0.005		See Ref.	406
	Methyl *n*-propyl ketone	21 ($T=\theta$)	49–514	$s_0 = 1.04 \times 10^{-15}\ M^{0.5}$							573
21 mass% styrene	Methyl *n*-propyl ketone	21 ($T=\theta$)	49–514	$s_0 = 0.83 \times 10^{-15}\ M^{0.5}$						M_n	344
Poly(chloroprene)	Methyl ethyl ketone	25	56–380	$s_0 = 3.1 \times 10^{-15}\ M^{0.5}$				0.773		M_w; OS; SE	444

Poly(isoprene)									
linear	Carbon tetrachloride	5	5		$D_0 = 10^{-7.73 \pm 0.08} M^{-0.54 \pm 0.04}$			$M_w/M_n = 1.05-1.11$	626
	Carbon tetrachloride	50	5		$D_0 = 10^{-7.47 \pm 0.05} M^{-0.61 \pm 0.01}$			$M_w/M_n = 1.02-1.07$	
4-armed star	Carbon tetrachloride	50	21.2–122		$D_0 = 10^{-7.53 \pm 0.15} M^{-0.57 \pm 0.03}$			M_w	
18-armed star	Carbon tetrachloride	50	61.7–630		$D_0 = 10^{-7.22 \pm 0.12} M^{-0.61 \pm 0.03}$			M_w	
3-armed star	Cyclohexane	–	137		2.4	–		$[\eta] = 0.958$ dL/g	988
4-armed star			173		1.87	76.5		$[\eta] = 0.973$ dL/g	
			380		1.20	138		$[\eta] = 1.74$ dL/g	
8-armed star			795		0.91	235		$[\eta] = 1.83$ dL/g	
			1760		0.52	250		$[\eta] = 3.30$ dL/g	
			4400		–	–		$[\eta] = 6.37$ dL/g	
12-armed star			96		–	–		$[\eta] = 0.294$ dL/g	
			810		0.89	–		–	
			3900		0.37	560		$[\eta] = 4.33$ dL/g	
			5280		0.305	331		$[\eta] = 5.63$ dL/g	
18-armed star			93		–	–		$[\eta] = 0.182$ dL/g	
			218		2.4	–		–	
			384		1.88	35		–	
			800		1.06	100		$[\eta] = 1.02$ dL/g	
			1480		0.71	169		$[\eta] = 1.58$ dL/g	
			3570		0.455	303		$[\eta] = 2.90$ dL/g	
natural rubber, crepe	Chloroform	20	270	15.5	2.24		3.32	$M_{s,D}$; Determ. of f_0/f_{sp} see Ref.	337
			485	15.5	1.26		5.10		
			930	27.5	1.16		5.26		
			125		2.63		3.82	M_w; OS; Determ. of f_0/f_{sp} see Ref.	337
			275		1.64		4.71		
			330		1.55		4.67		
			450		1.41		4.64		
			760		1.44		3.82		
	Cyclohexane	20	1600	4.6	0.48			$M_{s,D}$	
			1750	4.76	0.46				
			1800	4.35	0.41				
			1600	4.6	0.48		1.10	s_1; $M_{1,A}$	29
natural rubber	Hexane	20	270	9	3			$M_{s,D}$	337
			1660	21	1.01		1.54		
1,4-*cis*	Hexane	20		$s_0 = 5.01 \times 10^{-15} M^{0.45}$	$D_0 = 3.98 \times 10^{-2} M^{-0.55}$			$M_{s,D}$	324
1,4-*cis* ($TiCl_4$/AL $(C_7H_{15})_3$)	Hexane	25	460–970	$s_0 = 7.76 \times 10^{-2} M^{0.42}$				$M_w/M_n = 1.8-2.9$	627

TABLE 3. ACRYLIC POLYMERS

Polymer	Solvent	T (°C)	M ($\times 10^{-3}$) (g/mol)	s_0 ($\times 10^{13}$) (s)	k_s (cm^3/g)	D_0 ($\times 10^7$) (cm^2/s)	k_D (cm^3/g)	f_0/f_{sp}	v_2 (cm^3/g)	Remarks	Refs.
Poly(acrylamide)	Water	20	19.4–534	$s_t = 8.17 \times 10^{-15} M^{0.31}$		$D_A = 8.46 \times 10^{-4} M^{-0.69}$			0.769	D measured in H_2O/KCl (0.2 mol/dm^3); $M_{t,A}$	266,154
			130–8200	$s_w = 1.07 \times 10^{-15} M_w^{0.48\pm0.01}$		$D_{z,0} = 1.24 \times 10^{-4} M_w^{-0.53\pm0.01}$			0.708	SV; 15V; M_w/M_n = 1.15–1.4	628
		20	5000						0.693	C = 0.06, 1.2 g/dm^3	629
			250, 610						0.696	M_w; M_w/M_n = 1.5; C = 5, 10 g/dm^3	630
	Water/NaCl (0.2 mol/dm^3)	20	250, 610						0.687	M_w; M_w/M_n = 1.5; C = 5, 10 g/dm^3	630
		20		$s_0 = 8.17 \times 10^{-15} M_{s,D}^{0.31}$		$D_0 = 8.46 \times 10^{-4}$ M $^{-0.69}$					632
	Water/NaCl (0.5 mol/dm^3)	20	490–5150	$s_0 = 9 \times 10^{-15} M_w^{0.32}$						M_w/M_n = 2.5	633
		25	8400	$s_0 = 4.9 \times 10^{-15} M_w^{0.37}$	1570	0.3	88		0.697	M_w; $D_{z,0}$	631
									0.710		790
	Water/NaCl										
	Water/NaCl (0.1 mol/dm^3)		100–8000	$s_0 = 1.07 \times 10^{-15} M^{0.48\pm0.01}$		$D_0 = 1.24 \times 10^{-4} M^{-0.53\pm0.01}$					634, 635
	Water/NaCl (0.1 mol/dm^3)		8200							M_w; see Ref. for s_0 and k_s	667
H-acrylamide	Water/NaCl (1 M)	25	2330			0.505					1008
2,3,3-D_3- acrylamide		1710				0.630					
	Water/NaCl (2 g/dm^3)	20	8000			1.6	97			M_w; $D_{z,0}$	634
	Water/NaCl (20 g/dm^3)	20	160			0.14	1370			M_w; $D_{z,0}$	634
	Water/$NaNO_3$ (0.5 mol/dm^3)	25	260			1.29 ± 0.05	72			M_w; $D_{z,0}$	636
			460			1.15 ± 0.10	277			M_w; $D_{z,0}$	636
partially hydrolyzed Pusher 700	Water	26				0.280				D_z; C = 0.5 g/dm^3	637
(Dow Chemical)	Water/NaCl (0.1 mol/dm^3)					0.562				D_z; C = 0.5 g/dm^3; 4V	
	Water/NaCl (0.2 mol/dm^3)					0.383				D_z; C = 0.5 g/dm^3; 4V	
Poly(*p*-ethoxycarbonyl phenylmethacrylamide)	Acetone		479			7.05				M_w; D_A	267
			575			7.59					
			955			3.90					
			1060			2.52					
	Dimethylformamide		1000			2.18				M_w; D_A	267
	Dimethylformamide/ formamide (90/10)		740			1.16				M_w; D_A	267
			1100			1.11					
	Ethyl acetate		260–740			$D_A = 2.8 \times 10^{-4} M_w^{-0.69}$					267
Poly(*N*-isopropyl-acrylamide)	Water	15	290		99[a]			M_n 0.887	loroform	498	
		20		2.48							
		25	1000	3.04					0.896	M_w in chloroform	
		27.5		3.55							
		30		4.17							
		32		4.76							
		33		5.08						0.902	
Poly(*N*-isopropyl methacrylamide)	Water	20				$D_0 = 2.02 \times 10^{-4} M^{-0.57}$					1005

Poly(*N*-isopropylmethacrylamide-*co*-acrylamide)						
IPAM-100	Deionized water		3000	0.490	CLS, DLS	1006
IPAM-85			3100	0.439		
IPAM-70			4500	0.394		
IPAM-55			3900	0.421		
IPAM-40			2200	0.524		
IPAM			5200	0.335		
Poly(acrylamide-*co*-sodium-3-acrylamide-3-methylbutanoate-*co*-(2-(acrylamido)-2-methylpropyl) trimethylammonium chloride)					Terpolymer composition mol% AM: NaAMB: AMPTAC	1023
AM	NaAMB		AMPTAC			
ATABAM 0.5–0.5	Water/NaCl (1 M)	25	3430	0.498	99 : 0.5 : 0.5	
ATABAM 2.5–2.5			13900	0.313	89.1 : 5.1 : 5.8	
ATABAM 5.0–5.0			3450	0.476	85.9 : 7.9 : 6.2	
ATABAM 10–10			10800	0.264	80.5 : 9.7 : 9.8	
ATABAM 15–15			12200	0.313	74.6 : 11.5 : 14.0	
ATABAM 5.0–10			11200	0.361	75.7 : 13.6 : 10.7	
ATABAM 10–5.0			19400	0.389	85.3 : 4.5 : 10.2	
Poly(acrylamide-*co*-3-(2-acrylamido-2-methylpropane dimethylammonio)-1-propane-sulfonate) (AM-*co*-AMPDAPS)					AMPDAPS in the copolymer mol%	
DAPSAM-1	Water/1 M NaCl	25	3200	0.505	1	1010
DAPSAM-5			12400	0.316	5	
DAPSAM-10-2			700	0.401	9.6	
DAPSAM-10-3			21500	0.320	10	
DAPSAM-25-2			8200	0.397	27.7	
DAPSAM-40-2			15100	0.362	38.9	
DAPSAM-40-3			17500	0.324	40	
DAPSAM-60-2			5400	0.360	58.8	
DAPSAM-75-2			6200	0.490	70.1	
DAPSAM-100			3000	0.628	100	
Poly(acrylamide-*co*-NaAMPS-*co*-AMPTAC)						
ATASAM 0.5–0.5	Water/1 M NaCl	25	6030	0.423	$dn/dC = 0.1426\ cm^3/g$	1022
ATASAM 2.5–2.5			2780	0.577	$dn/dC = 0.1481\ cm^3/g$	
ATASAM 5–5			5070	0.381	$dn/dC = 0.1510\ cm^3/g$	
ATASAM 10–10			5870	0.449	$dn/dC = 0.1395\ cm^3/g$	
ATASAM 15–15			6770	0.433	$dn/dC = 0.1344\ cm^3/g$	
ATASAM 10–5			3880	0.413	$dn/dC = 0.1376\ cm^3/g$	
Poly(NaAMPS-*co*-AMPTAC)					AMPTAC in the copolymer mol%	1021
ATAS-0	Water/1 M NaCl	25	6120	0.387	0.0	
ATAS-10-2			8220	0.419	14.7	
ATAS-25-2			6200	0.473	36.1	
ATAS-40-2			7920	0.385	45.4	
ATAS-50-2			7680	0.463	51.7	
ATAS-70-2			4980	0.406	65.7	
ATAS-100			1470	0.637	100.0	
Poly(1,4-benzamide)	Dimethylacetamide/ 3% (g/mol) LiCl	25	55	$D_0 = 4.38 \times 10^{-4}\ M_w^{-0.82}$		1007
Poly(1,4-phenylene terephthalamide)	96 wt.% H_2SO_4	30	48.3	0.072		
			38.4	0.088		
			22.7	0.113		
			15.9	0.159		

TABLE 3. *cont'd*

Polymer	Solvent	T (°C)	M ($\times 10^{-3}$) (g/mol)	s_0 ($\times 10^{13}$) (s)	k_s (cm^3/g)	D_0 ($\times 10^7$) (cm^2/s)	k_D (cm^3/g)	f_0/f_{sp}	v_2 (cm^3/g)	Remarks	Refs.
			14.5			0.196					
						$D_{z,0} = 2.72 \times 10^{-5}\ M_w^{-0.77}$					
	96 wt.% H_2SO_4/	30	42.6			0.074					
	0.05 M K_2SO_4		29.8			0.093					
						$D_{z,0} = 1.51 \times 10^{-5}\ M_w^{-0.72}$					
Poly(*m*-phenylene isophthalamide)	Dimethylacetamide	26	4.2–230	$s_0 = 1.72 \times 10^{-15}\ M_w^{0.44}$		$D_0 = 1.13 \times 10^{-4}\ M^{-0.56}$			0.66	SV	1082
	Dimethylacetamide/ 3% LiCl	25		$s_0 = 0.68 \times 10^{-15}\ M_w^{0.44}$		$D_0 = 0.55 \times 10^{-4}\ M^{-0.56}$			0.71		
Poly(acrylonitrile)	Dimethylformamide	20	78.7	1.72						M_V	569
			67–1030	1.65–4.68						See Ref. for s and M_{MW}	533
		25	48	1.52		3.6			0.83	s_t; D_w, $M_{t,w}$	115
			113	2.08		2.1					
			155	2.36		1.75					
			270	2.95		1.25					
		25	105	2.04					0.830	s_t; M_w	74
			210	2.48							
			16			7.14				D_w; D_n given in Ref.	206
			28			5.72					
			63			5.08					
			193			4.03					
			214			3.91					
		35	28–575			$D_0 = 2.19 \times 10^{-4}\ M^{-0.58}$	$k_D = 2.31 \times 10^{-9} \times D_0^{-1.29}$				201
			980	4.6						$C = 1.5$–10 g/dm^3	792
	Dimethylformamide/ benzene 30%	RT	320	3.08						$M_{s,n}$	462
	Dimethylformamide/ benzene 37%	RT		7000	138					$M_{s,n}$ calculated from $s_0 = 0.025$	
	Dimethylformamide/ tetrahydrofuran (1/1)		1200	5.78[b]						M_n; $C = 0.648$ g/ dm^3; 5V	638
			210	2.94[b]						M_n; $C = 1.323$ g/ dm^3; 12V	
	Dimethylformamide/methanol		1200	4.03[b]						M_n; $C = 1.270$ g/ dm^3; 4V	
Poly(acrylonitrile-*stat*-styrene)	Butanone		330	12.1						$C = 1.5$–10 g/dm^3	792
Poly(acrylonitrile-*alt*-styrene)	Butanone		170	10.2						$C = 1.5$–10 g/dm^3	792
Poly(amidobenzimidazole)	Dimethylacetamide	25	74.7	1.33	537						1046
			72.3	1.32	525						
			63.1	1.28	550						
			55.7	1.25	428						
			46.9	1.11	285						
			39.6	0.99	183						
			27.3	0.93	142						
			10.1	0.80	51						

	Dimethylacetamide/	25	79.3	1.45	900					
	0.3% LiCl		60.6	1.33	890					
			41.1	1.12	720					
			29.3	0.88	460					
Poly(benzyl acrylate-*co*-methyl acrylate)										
different comp.	Methyl ethyl ketone	20							v_2 and M given	506
Poly(*n*-butyl-acrylate)	Methyl isobutyl ketone	23.3	46					0.944	M_v	148
Poly(*tert*-butyl-acrylate)	Methyl ethyl ketone	25	306	17.7	0.94				M_w; s_0	512
	Acetone			0.207	0.84					
	Methanol			0.237	0.53					
	Pentane			0.266	0.22					
	Methyl ethyl ketone	25	237	0.160	0.88				M_w; s_0	
	Acetone			0.194	0.74					
	Methanol			0.230	0.49					
	Pentane			0.244	0.21					
	Acetone	25	180	0.182	0.64				M_w; s_0	
	Methanol			0.203	0.43					
	Pentane			0.228	0.20					
	Methyl ethyl ketone	25	149	0.139	0.65				M_w; s_0	
	Acetone			0.162	0.55					
	Methanol				0.39					
	Pentane			0.191	0.19					
	Methyl ethyl ketone	25	75	0.109	0.59				M_w; s_0	
	Acetone			0.117	0.32					
	Methanol			0.127	0.22					
	Pentane			0.137	0.13					
Poly(*n*-butyl methacrylate)	Methyl isobutyl ketone	21.2	820					0.922	M_v	148
	Propan-2-ol	21.5	40–8000			$6.3 \times 10^{-5} M^{-0.50}$				399
Microgels	Ethyl acetate	20	254			0.174			M_w, $C = 0.1$–0.5 g/dm^3; see Ref.	646
			254			0.145			M_w, $C = 0.1$–0.5 g/dm^3; see Ref.	
	Tetrahydrofuran		340			0.181			M_w, $C = 0.1$–0.5 g/dm^3; see Ref.	
			380			0.191			M_w, $C = 0.1$–0.5 g/dm^3; see Ref.	
		25		$s_0 = 0.12 M^{0.31}$						1052
Poly(*tert*-butyl methacrylate)	Butyl acetate	20		$s_0 = 3.02 \times 10^{-5} M_w^{0.41}$					$C = 0.5$ g/dm^3	551
		21				$D_0 = 2.51 \times 10^{-4} M_w^{-0.55}$			D_A; $M_{s,D}$ given in Ref.	
Poly(cetyl methacrylate)	Heptane	21		$s_0 = 1.42 \times 10^{-14} \times M^{0.36}$		$D_0 = 1.74 \times 10^{-3} M^{-0.64}$			$M_{s,D}$; D_A	560
Poly(cholesteryl acrylate)	Benzene	21	140–780	$s_0 = 1.9 \times 10^{-15} M^{0.46}$		$D_0 = 3.2 \times 10^{-4} M^{-0.54}$			$M_{s,D}$	580
Poly(2.6-diisopropyl-phenylmethacrylate)	Toluene	25						0.789		1053
Poly(2.6-dimethyl-phenylmethacrylate)	Toluene	25						0.894		1053
Poly(acrylic acid)	Water/NaCl	20–22[c]	1100		5.6		4.77	0.73	$M_{s,D}$;	555
	(0.2 mol/dm^3)									
	(0.02 mol/dm^3)					35.0	20.0			
	(0.012 mol/dm^3)			7.3 ± 0.5	81.0	0.65 ± 0.02[d]	28.2			
	(0.006 mol/dm^3)				114.0		49.0			

TABLE 3. *cont'd*

Polymer	Solvent	T (°C)	M ($\times 10^{-3}$) (g/mol)	s_0 ($\times 10^{13}$) (s)	k_s (cm^3/g)	D_0 ($\times 10^7$) (cm^2/s)	k_D (cm^3/g)	f_0/f_{sp}	v_2 (cm^3/g)	Remarks	Refs.
	(1.0 mol/dm^3)		420		2.4		0.2			$M_{s,D}$	
	(0.2 mol/dm^3)				4.2		1.0				
	(0.012 mol/dm^3)			6.5 ± 0.5	32.0	1.35 ± 0.05[d]	10.0				555
	(0.006 mol/dm^3)				60.0		27.4			→	
	(0.0012 mol/dm^3)						146				
	(1.0 mol/dm^3)		70				22.3			$M_{s,D}$	
	(0.2 mol/dm^3)				0.0		22.3				
	(0.012 mol/dm^3)			2.4 ± 0.1	2.75	3.2 ± 0.1[d]	150				
	(0.006 mol/dm^3)				8.0		286				
Poly(ethyl acrylate)	Methyl isobutyl ketone	24.3	34						0.951	M_v	148
	n-Propanol	28	18–155	$s_0 = 1.05 \times 10^{-2}\ M_n^{0.47}$						M_{MW}	456
Poly(ethyl acrylate-*co*-acrylic-acid) sodium salt	Water/NaCl (0.05 mol/dm^3)		185–1300			$D_{o,z} = 5.76 \times 10^{-4}\ M^{-0.65}$				$M_w/M_n = 1.8$–2.3	637
	(0.1 mol/dm^3)					$D_{o,z} = 8.55 \times 10^{-4}\ M^{-0.67}$					
	(0.3 mol/dm^3)					$D_{o,z} = 3.73 \times 10^{-4}\ M^{-0.59}$					
	(0.5 mol/dm^3)					$D_{o,z} = 1.54 \times 10^{-4}\ M^{-0.52}$					
	(0.7 mol/dm^3)					$D_{o,z} = 1.41 \times 10^{-4}\ M^{-0.51}$					
	(1.0 mol/dm^3)					$D_{o,z} = 1.24 \times 10^{-4}\ M^{-0.50}$					
	(1.2 mol/dm^3)					$D_{o,z} = 1.10 \times 10^{-4}\ M^{-0.49}$					
	2-Heptanone					$D_{o,z} = 1.35 \times 10^{-4}\ M^{-0.51}$					
Poly(ethyl acrylate-*co*-methylacrylate) different comp.	Methyl ethyl ketone	20								v_2 and M given	506
Poly(ethyl methacrylate)	Acetone	20	77–7440	$s_0 \sim M^{0.43}$		$D_0 \sim M^{-0.57}$		$f_{sp} \sim M^{0.57}$	0.798	$M_{t,A}$	59
			34.1–9350	8.95–120		17.4–0.85			0.798	$M_{t,A}$; s_t; See Ref.	18
									0.7942	extrapolated value	268
			24.6–7440	7.45–107	23–60	20.0–0.95	0–63			$M_{t,w}$; s_t; D_A, See Ref.	52
	Methyl isobutyl ketone	22.9	410						0.863	M_v	148
Poly(isooctyl methacrylate)	(theta-solvent)[e]	25	1036	63.0–67.5					0.900	A[e]	427
			875							$C = 2.5$ g/cm^3; s_w (Trautmann)	
Poly(phenyl methacrylate)	Toluene	25							0.789		1053
Poly(sulfoalkyl methacrylate) alkyl: hexyl	0.1 M NaCl	25	306			1.22	1.54×10^{-4}			$M_w/M_n = 1.5$; $dn/dC = 0.135$ cm^3/g	100
octyl			494			1.02	1.72×10^{-4}			$M_w/M_n = 2.0$; $dn/dC = 0.140$ cm^3/g	
decyl			701			1.00	1.99×10^{-4}			$M_w/M_n = 1.8$; $dn/dC = 0.149$ cm^3/g	
ethyl			734			0.975	2.07×10^{-4}			$M_w/M_n = 2.1$; $dn/dC = 0.170$ cm^3/g	
Poly(methacrylic acid)	Dimethylsulfoxide	25	34	0.46						M_{MW}	638
			130	1.02							
			260	1.27							
			429	1.66							
			432	1.85							
			381	1.60							