

Prosijek molarnih masa

1. Izračunajte brojčani i maseni prosjek molarne mase (\bar{M}_n i \bar{M}_w) za tri makromolekule pojedinačnih molarnih masa 150 000, 200 000 i 250 000 g/mol.
2. Izračunajte brojčani i maseni prosjek molarne mase (\bar{M}_n i \bar{M}_w) polimera koji se sastoji od:

broj molekula	25	50	70	100
molarna masa/g mol ⁻¹	8 000	10 000	12 000	15 000

3. 200 g polimera A i 200 g polimera B miješa se bez reakcije. Izračunajte \bar{M}_n i \bar{M}_w .

	\bar{M}_n	\bar{M}_w
A	1.2×10^5	4.5×10^5
B	5.6×10^6	8.9×10^6

4. Frakcioniranjem polistirena dobiveni su sljedeći podaci:

$w / \%$	5	30	50	10	5
M_r	5 000	7 000	10 000	15 000	17 000

Izračunajte brojčani i maseni prosjek molarne mase (\bar{M}_n i \bar{M}_w), kao i stupanj polidisperznosti (uniformnosti) uzorka.

5. Calculate the viscosity average molar mass of polystyrene sample using the data obtained by measuring viscosity in toluene at 25 °C. Experimentally obtained data are presented in the Table; $K = 12 \times 10^{-5} \text{ cm}^3 \text{ g}^{-1}$, $\alpha = 0,71$.

$c / \text{g}/100 \text{ mL}$	t / s	$t - t_0 / t_0$	$\eta_{\text{sp}} / c/\text{g}^{-1} \text{ cm}^3$
0	67,94		
0.402	107.7	0.585	145.5
0.505	121.05	0.782	154.8
0.595	132.77	0.954	160.3
0.804	161.39	1.404	174.6
1.207	227.84	2.353	194.9

6. Osmotic pressure was measured in diluted polystyrene solution in toluene ($\rho = 0,785 \text{ g cm}^{-3}$) at 378 K. Calculate the number average molar mass \bar{M}_n .

$c / \text{g L}^{-1}$	1.35	2	2.7	3.71	4.52	5.94
h / cm	1.46	2.24	3.16	4.52	5.74	8.1
Π / Pa	1.12	1.72	2.43	3.48	4.42	6.24

7. Calculate the hydrodynamic radius of spherical asphaltene samples from the diffusion data obtained from NMR measurements. Boltzmann constant is $k_B = 1.3806 \times 10^{-23} \text{ J K}^{-1}$, temperature 25 °C and viscosity of the solvent $\eta = 6.02 \times 10^{-4} \text{ Pa s}$.

sample	1	2	3	4	5
$D/10^{-10}$ $\text{m}^2 \text{ s}^{-1}$	3.68	4.17	5.00	5.32	5.77

8. The values of the solubility parameter δ_1 in $(\text{cal}/\text{cm}^3)^{1/2}$ are given as follows:

n-Hexane 7.24

Carbon tetrachloride 8.58

Benzene 9.15

Acetone 9.71

Methanol 14.5

The solubility parameters δ_2 in $(\text{cal}/\text{cm}^3)^{1/2}$ are 8.6 for polystyrene and 9.1 for poly(methyl methacrylate). Predict by calculation whether each of the two polymers will dissolve in the above five solvents.