

Poly-DADMAC standard materials

Polydiallyldimethyl ammonium chloride (poly-DADMAC) is a commercial cationic polymer (Figure 1). It's used in many technical processes, e.g. as flocculation additive in the paper industry or for wastewater treatment. A series of poly-DADMAC samples with different molar masses was synthesized and characterized for the application as standard materials in process analytics. The molecular characterization of these materials was done by size exclusion chromatography, combined with a multi angle laser light scattering detector (SEC-MALLS). The number average molar mass was additionally verified with osmometric measurements (membrane osmometry).

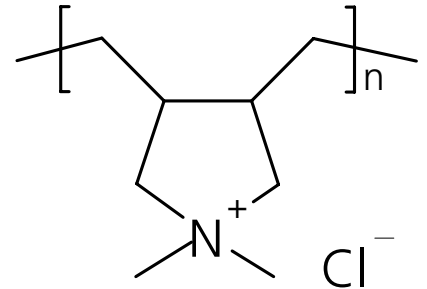


Figure 1
Chemical structure of poly-DADMAC.

Probe	MALLS-GPC		Osmometrie	
	$M_n \cdot 10^{-3}$ [g/mol]	$M_w \cdot 10^{-3}$ [g/mol]	$M_n \cdot 10^{-3}$ [g/mol]	$A_{20} \cdot 10^2$ [ml-mol/g ²]
Poly-DADMAC 1	74	55	42	1,11
Poly-DADMAC 2	162	117	101	1,40
Poly-DADMAC 3	245	180	178	1,75
Poly-DADMAC 4	643	367	373	1,61

The obtained number average molar masses from SEC-MALLS measurements for samples with molar masses of more than 10^5 g/mole were too small (Figure 2). The detection of the low molecular fraction of the sample is getting more and more difficult, therefore the high-molecular fraction is overestimated.

With membrane osmometry the number average molar mass is obtained from the reciprocal value of the ordinate intercept of the pred-c-plot. Additionally, from the slope of the gradient at low concentrations the 2nd virial coefficient can be obtained (Figure 3).

Figure 2
Comparison of SEC-MALLS and membrane osmometry.

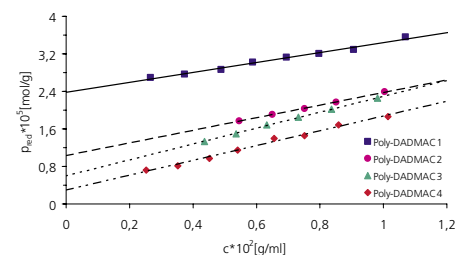


Figure 3
Reduced osmotic pressure of poly-DADMAC samples with different molar masses plotted against the polymer concentration c.

Cooperation

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