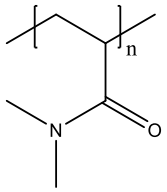
CERTIFICATE OF ANALYSIS

Product name and structure: **Poly(N,N-dimethyl acrylamide)**

ISO Certified Reference Material



PS standards kit number: **R12-2.7k1.4m-PDMA**

Part numbers:

1-PDMA-2.7k_R5113	5- PDMA-80k_R40530D	9-PDMA-400k_R14721
2-PDMA-4k_R8798	6- PDMA-150k_R14735	10- PDMA-750k_R41437B
3-PDMA-10k_R41270A	7- PDMA-250k_R40530G	11- PDMA-950k_R41446K
4-PDMA-40k_R41429	8- PDMA-350k_R40530F	12- PDMA-1.4M_R41446G

PS Certified Reference Material:

Polymer:	Poly(N,N-dimethyl acrylamide) (PDMA)
Chemical formula:	$[C_5H_9NO]_n$
CAS number:	26793-34-0
Purity:	99.9 %
Appearance:	White, yellow, colorless solid material
Production:	PDMA was synthesized by living anionic technique, free-radical controlled polymerization initiated by AIBN, RAFT polymerization. Obtained polymer fractionated using proper solvent/nonsolvent.
Quality Control:	Polymer Source is **ISO 9001:2015** certified company, and our Testing and Calibration Laboratory is complying with **ISO 17025** standards.

GPC/SEC Instrument Details and Analysis Conditions:

Instrument:	Malvern Omnisec Reveal & Resolve GPC/SEC System
Detectors:	Triple detector (RI, Viscometer, RALS 90° and LALS 7°)
Columns:	Two columns 300×7.5 mm, Viscotek: • A600M General Mixed 300 x 8.0 mm (No : L1160508) • A600M General Mixed 300 x 8.0 mm (No : L1282002)
Solvent (mobile phase):	0.25M $NaNO_3$ + NaH_2PO_4 Aqueous Buffer pH 7.0 (Filtrated on 0.22µm Nylon membrane)
Temperature:	30 °C
Flow rate:	1 mL/min
Injection volume:	100 µL
System calibration:	Polyethylene oxide (Mn: 23 476 g/mol)
Data acquisition software:	Omnisec GPC/SEC Software
Sample concentration:	0.5–2 mg/mL
dn/dc (mL/g)	0.165
*Abbreviations used in Results:	M_n, M_w, M_p, and M_z are the respective number, weight, peak amd Z molecular weight averages. M_w/M_n is the polydispersity ratio. $[\eta]$ is the intrinsic viscosity (in the experimental conditions).

^{1}H NMR Instrument Details and Analysis Conditions:

Instrument:	Bruker Avance III 500 NMR spectrometer
Solvent:	D_2O (99.8%D)

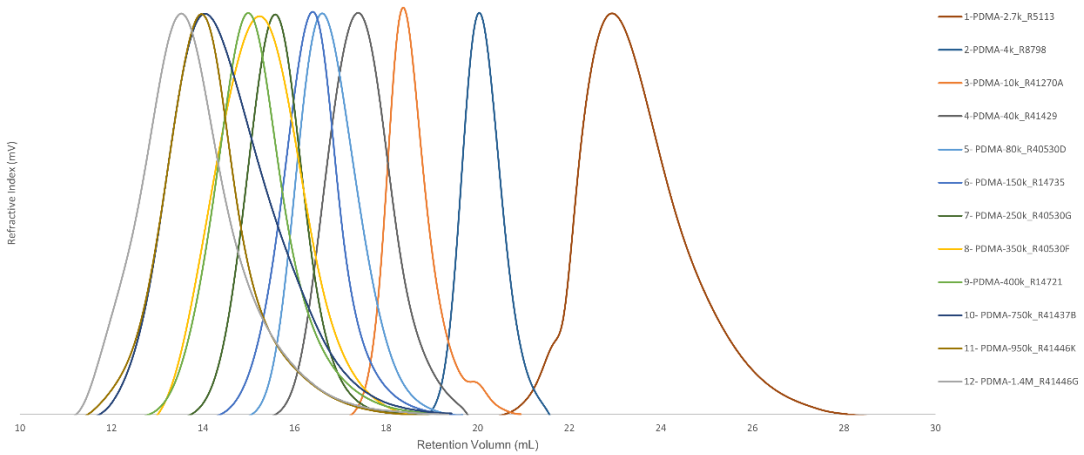
DSC Instrument Details and Analysis Conditions:

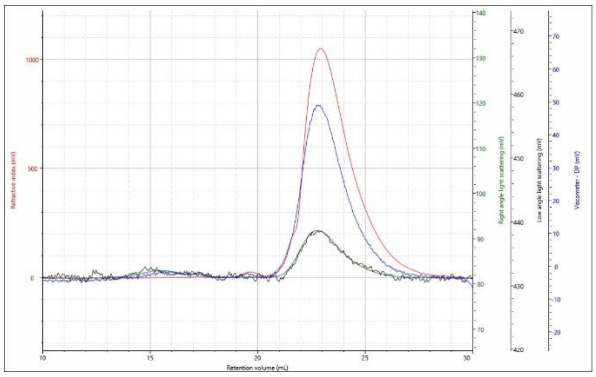
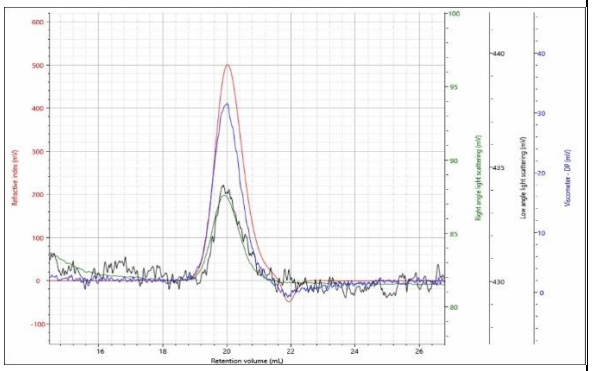
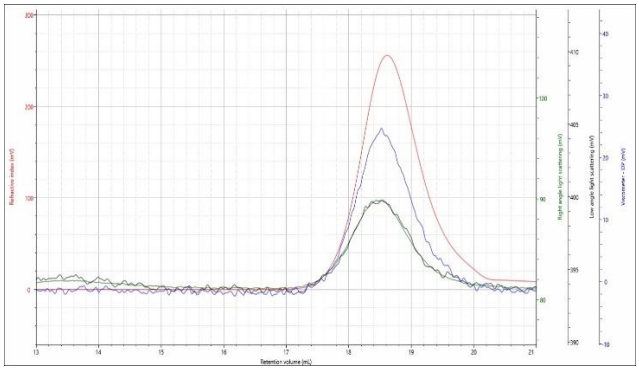
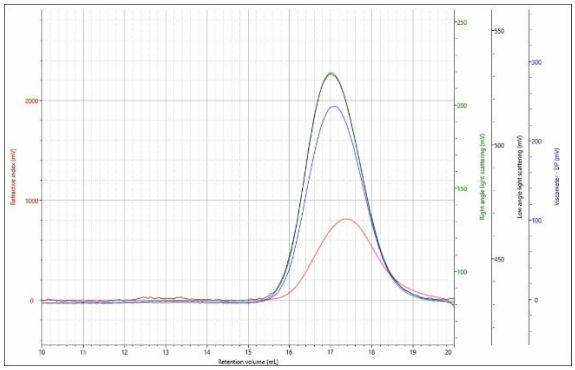
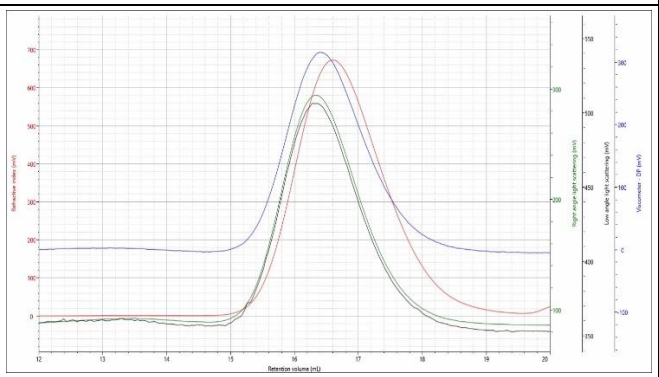
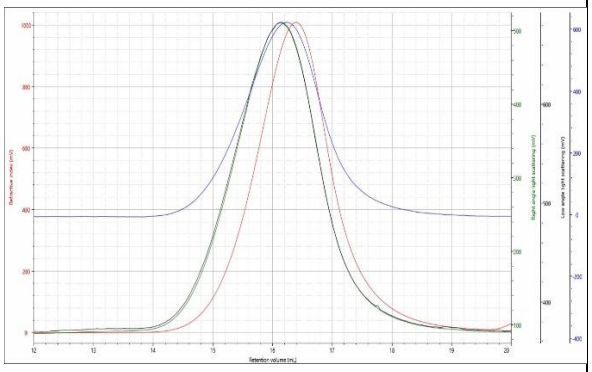
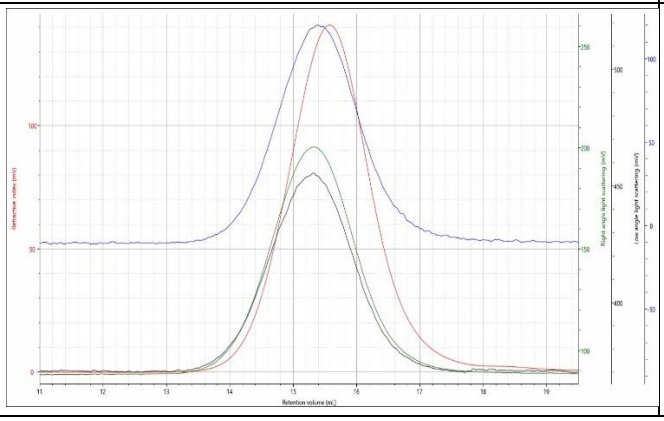
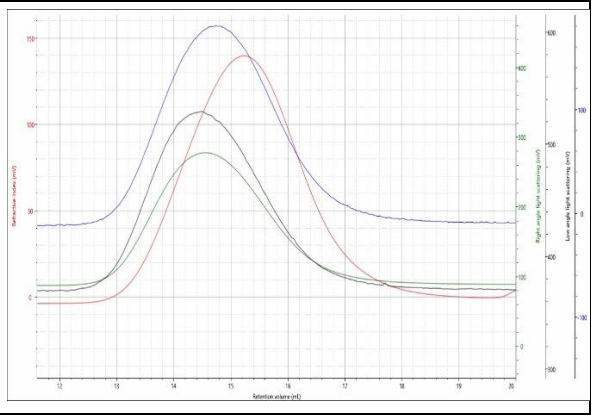
Instrument:	TA Instruments DSC Q100
Gas:	Nitrogen
Thermal analysis:	Glass transition temperature (T_g) was measured at a scan rate of 10°C/min.

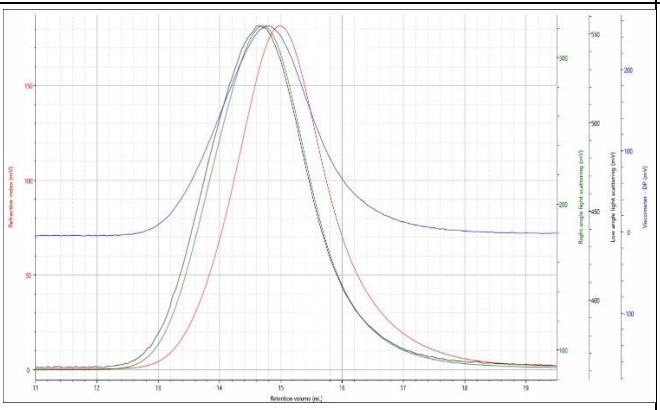
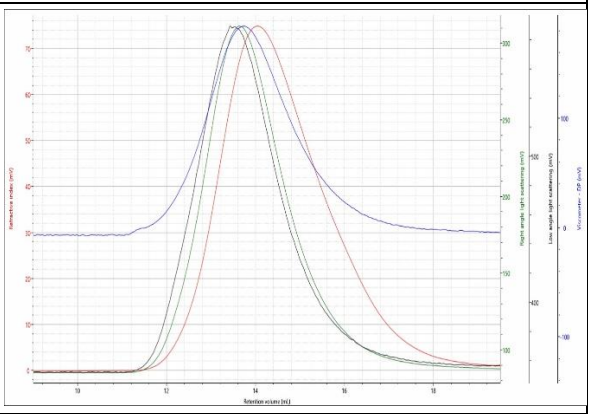
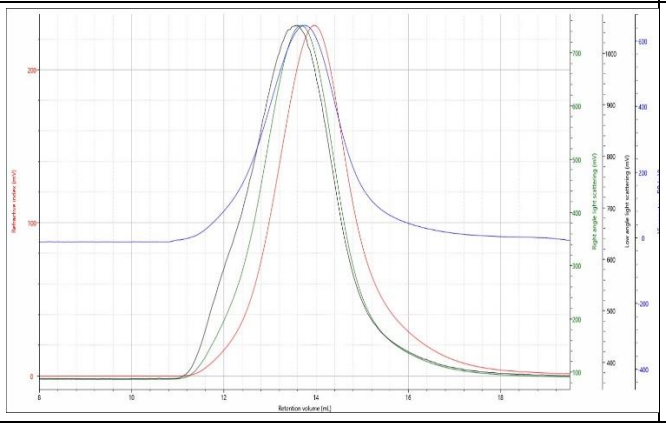
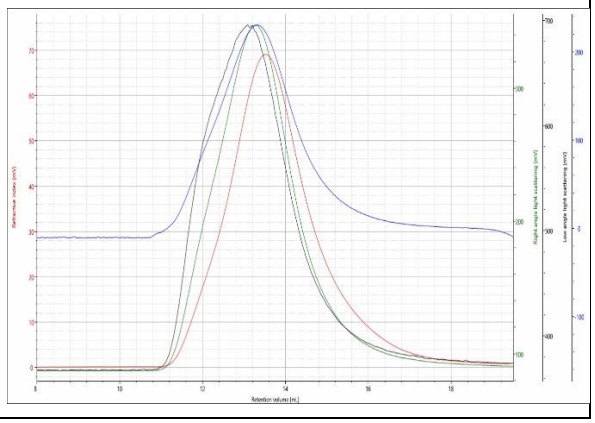
RESULTS:

Sample #	GPC/SEC Results						T_g (°C)
	Molecular weight averages (g/mol)				M_w/M_n	$[\eta]_w$ (dL/g)	
	Mn	**Mw**	**Mp**	**Mz**			
1-PDMA-2.7k	2,700	2,900	3,000	3,200	1.08	0.06	23
2-PDMA-4k	4,100	4,400	4,100	5,700	1.06	0.07	38
3-PDMA-10k	10,700	11,900	11,300	13,600	1.11	0.12	42
4-PDMA-40k	38,000	54,000	49,000	74,000	1.43	0.33	41
5-PDMA-80k	82,000	99,000	98,000	121,500	1.20	0.52	84
6-PDMA-150k	143,000	164,500	135,000	211,000	1.15	0.77	87
7-PDMA-250k	254,000	290,000	257,000	346,500	1.14	1.12	91
8-PDMA-350k	346,000	447,500	375,500	599,000	1.29	1.56	96
9-PDMA-400k	400,000	464,500	418,000	557,000	1.16	1.68	95
10-PDMA-650k	673,000	875,000	930,500	1,129,500	1.30	2.64	100
11-PDMA-950k	949,500	1,082,000	939,000	1,314,500	1.14	3.38	96
12-PDMA-1.4m	1,399,000	1,563,000	1,359,000	1,797,000	1.12	4.19	101

Chromatograms Overlay

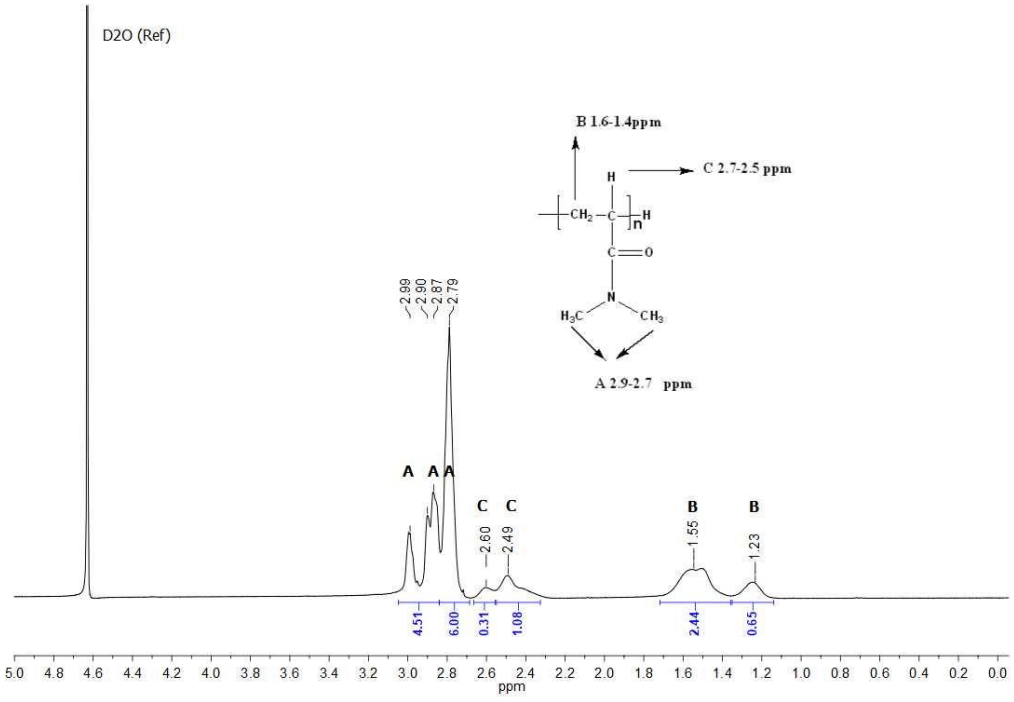


#	Chromatogram plot:	#	Chromatogram plot:
1-PDMA-2.7k:		2-PDMA-4k:	
3-PDMA-10k:		4-PDMA-40k:	
5-PDMA-80k:		6-PDMA-150k	
7-PDMA-250k:		8-PDMA-350k	

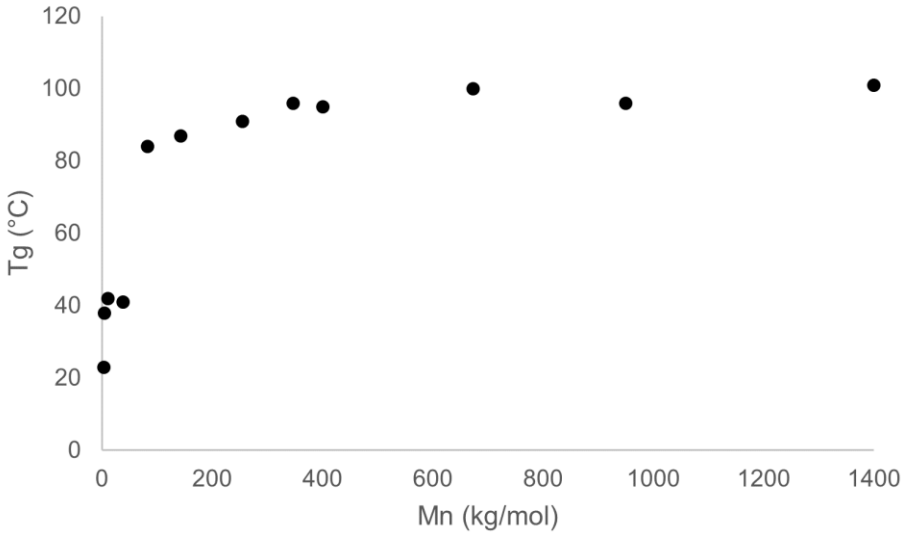
#	Chromatogram plot:	#	Chromatogram plot:
9-PDMA-400k:		10-PDMA-650k:	
11-PDMA-950k:		12-PDMA-1.4m	

Sample of PDMA ^{1}H NMR spectra is presented below.

7-PDMA-250k_R40530G



Dependence of glass transition temperature (T_g) of PDMA from its molecular weight:



The above analyses run according to ISO 9001:2015 and ISO 17025 standards.
Manufacture and quality control run according to *Polymer Source* methods of analysis.

Sunil K. Varshney, Ph.D.

124 Avro street • Dorval (Montreal), Quebec H9P 2X8 • Canada
Tel.: (1) 514-421-5517, (1) 514-421-5506 • Toll-Free: 1-866-422-9842 • Fax: (1) 514-421-5518
E-mail: info@polymersource.com • Web: www.polymersource.ca