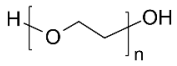
CERTIFICATE OF ANALYSIS

Product name and structure:	**Poly(ethylene oxide) or Poly(ethylene glycol),** α,ω-bis(hydroxy)-terminated **ISO Certified Reference Material**



PS standards kit number: **R12-0.6k360k-PEO**

Part numbers:

1-PEO-0.6k_R5489	5- PEO-10k_R0011	9-PEO-100k_R44491D
2-PEO-1k_R0009	6- PEO-20k_R43979	10- PEO-180k_R4214
3-PEO-2k_R40000	7- PEO-30k_R43978	11- PEO-270k_R4221
4-PEO-6k_R8016	8- PEO-50k_R44491A	12- PEO-360k_R5617

PS Certified Reference Material:

Polymer:	Poly(ethylene oxide) (PEO) or Poly(ethylene glycol) (PEG) α,ω-bis(hydroxy)-terminated
Chemical formula:	$C_{2n}O_{n+1}H_{4n+2}$
CAS number:	25322-68-3
Purity:	99.9 %
Appearance:	White solid material
Production:	Poly(ethylene glycol) or poly ethylene oxide is obtained by living anionic polymerization.
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):	Deionized water (Filtrated on 0.22µm Nylon membrane)
Temperature:	30 °C
Flow rate:	1 mL/min
Injection volume:	100 µL
System calibration:	Malvern PolyCAL™ PEO Std (Mn: 23 476 g/mol)
Data acquisition software:	Omnisec GPC/SEC Software
Sample concentration:	0.5–2 mg/mL

*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:

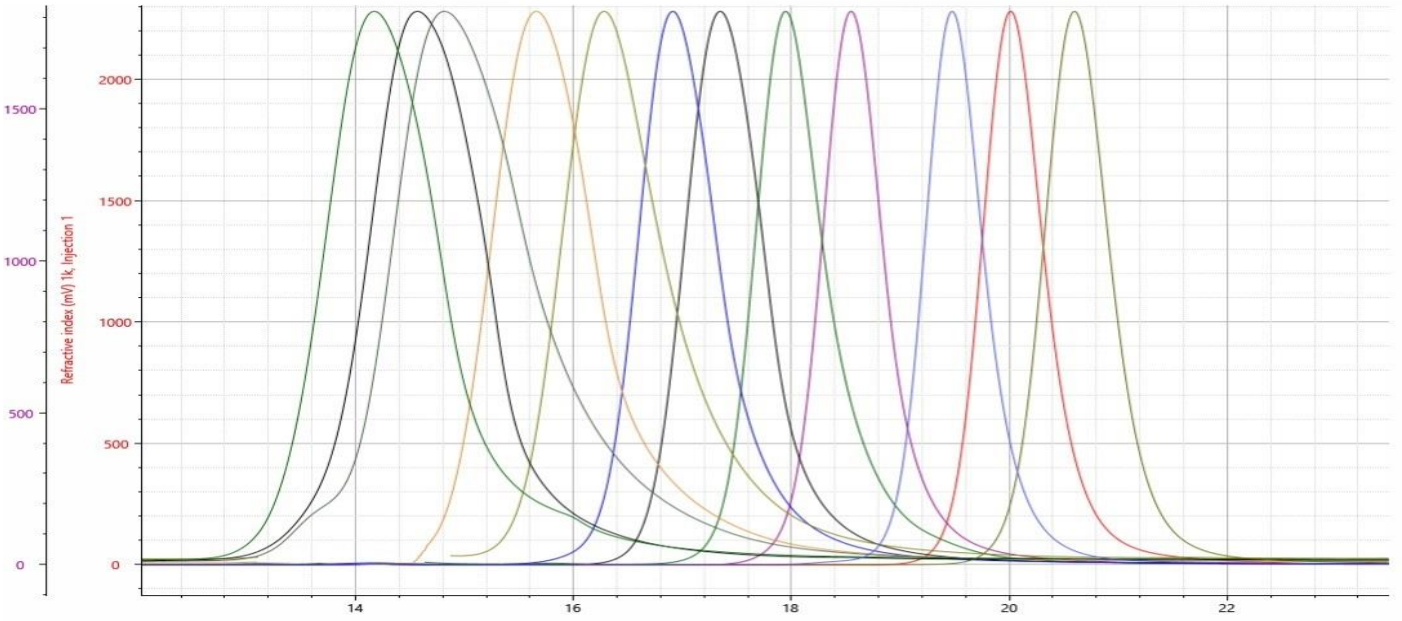
Instrument:	Bruker Avance III 500 NMR spectrometer
Solvent:	DMSO-d_6 (99.9%D)

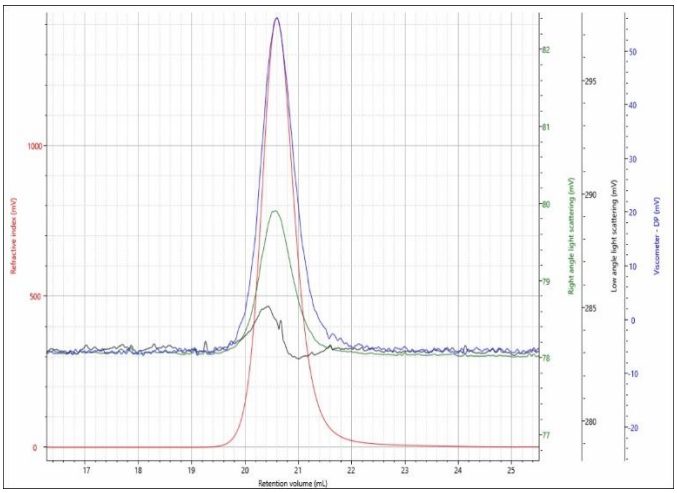
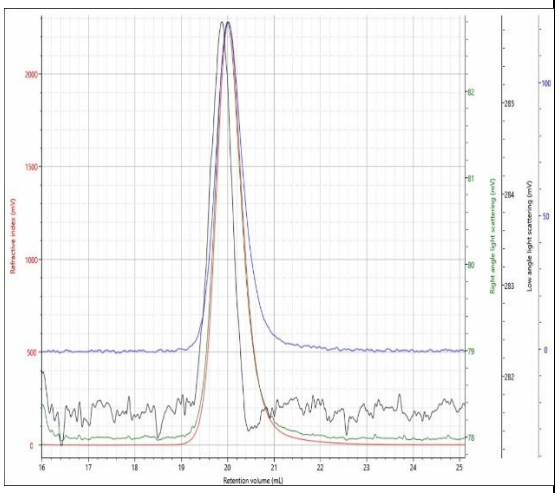
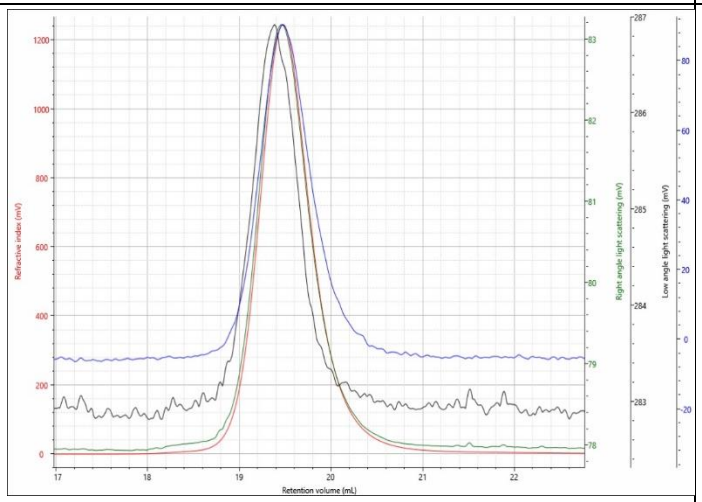
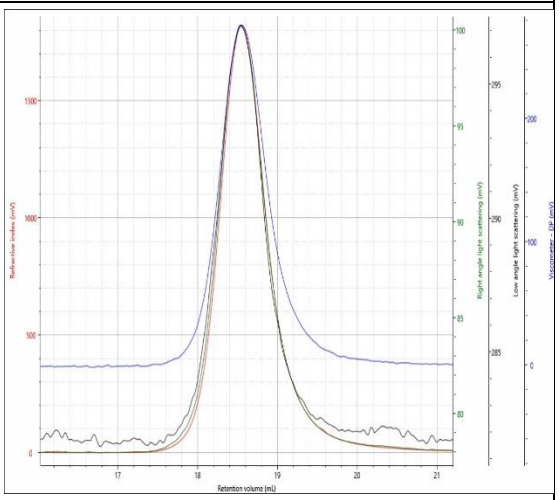
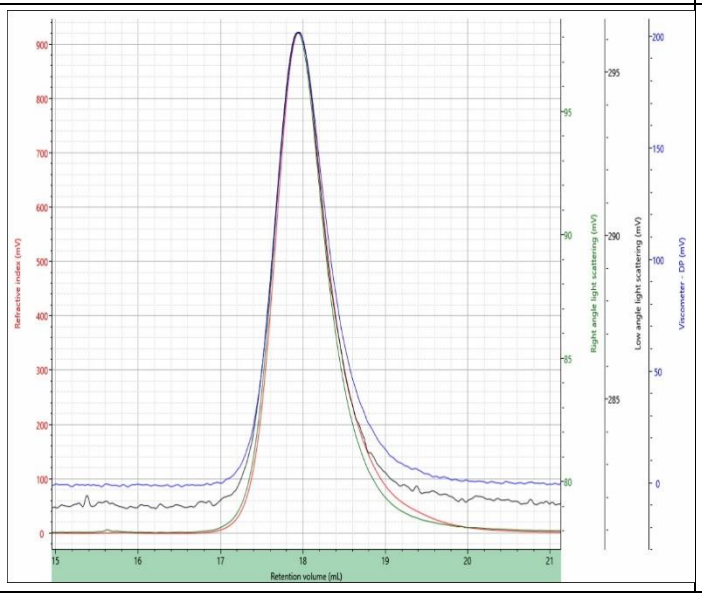
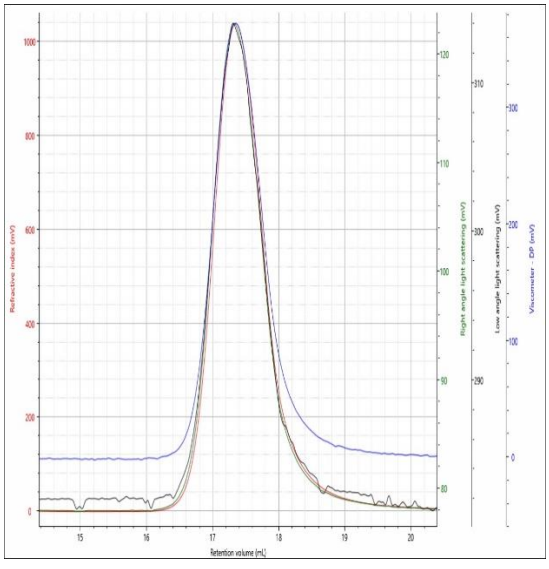
DSC Instrument Details and Analysis Conditions:

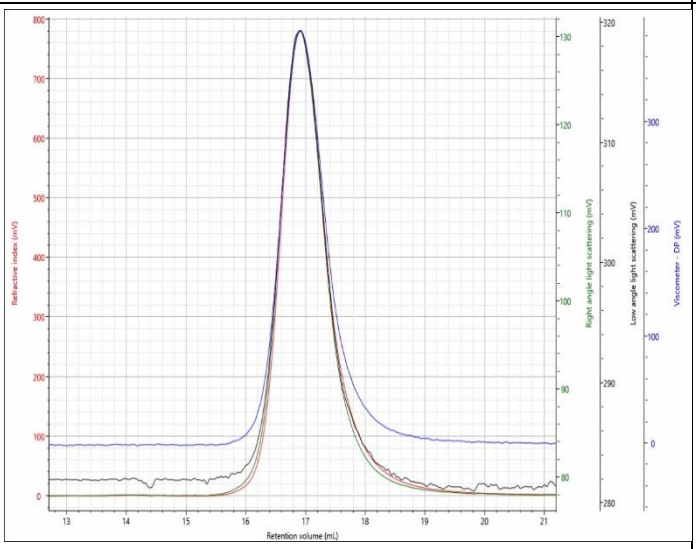
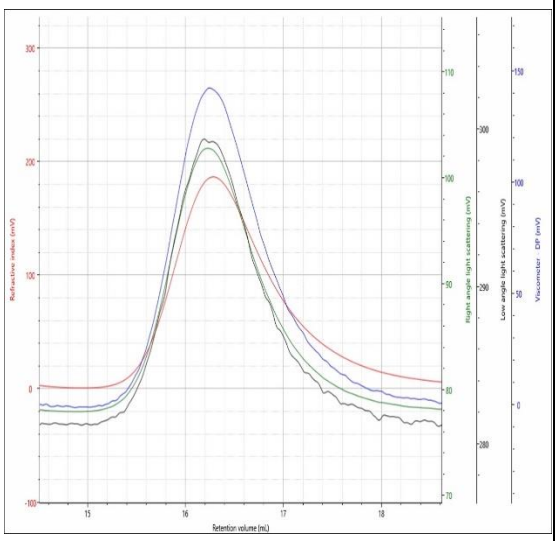
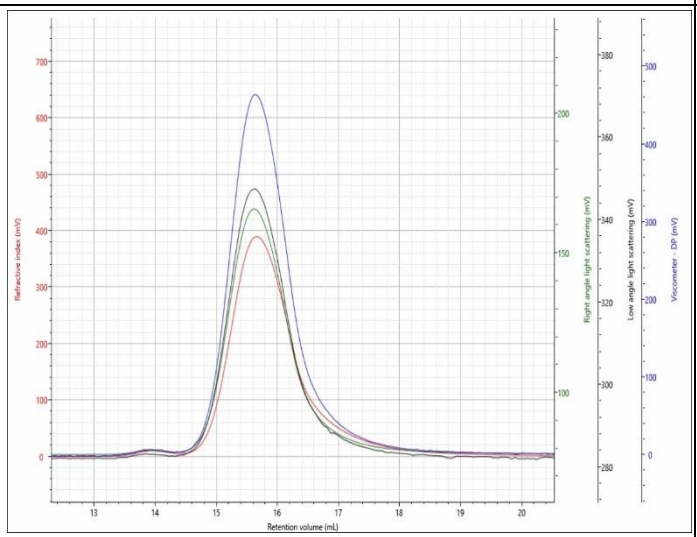
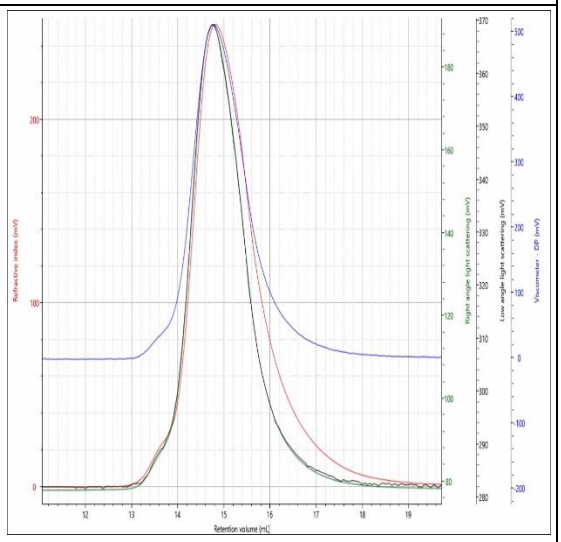
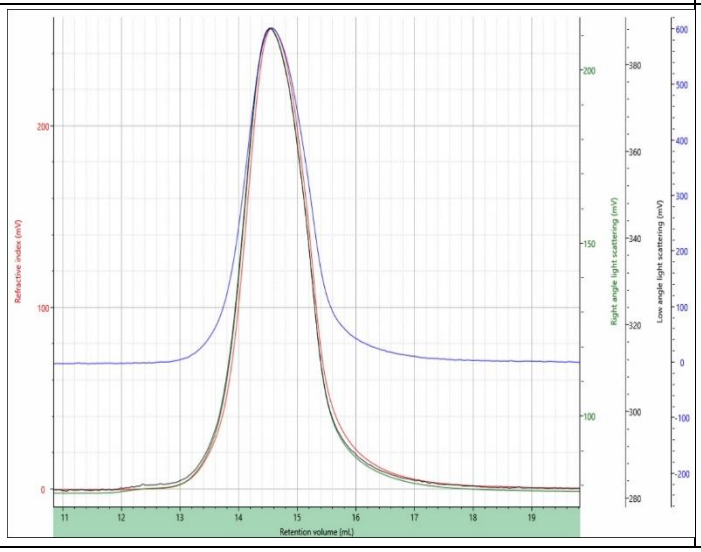
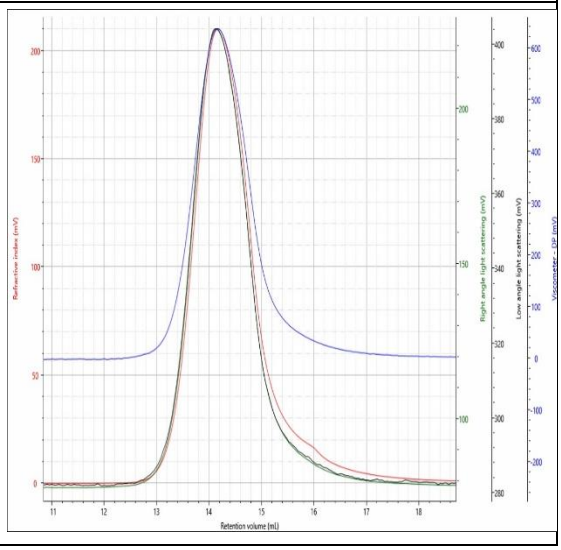
Instrument:	TA Instruments DSC Q100
Gas:	Nitrogen
Thermal analysis:	Glass transition temperature (T_g) was measured at a scan rate of 10°C/min.

RESULTS:

Sample #	GPC/SEC Results					
	Molecular weight averages (g/mol)					$[\eta]_w$ (dL/g)
	Mn	**Mw**	**Mp**	**Mz**	**Mw/Mn**	
1-PEO-0.6k	610	620	590	640	1.02	0.2226
2-PEO-1k	950	960	940	970	1.01	0.2755
3-PEO-2k	1,900	1,900	1,900	2,000	1.01	0.3928
4-PEO-6k	5,600	5,700	5,500	5,700	1.01	0.7694
5-PEO-10k	9,500	9,600	9,800	9,700	1.01	1.0743
6-PEO-20k	19,100	19,300	19,200	19,500	1.01	1.773
7-PEO-30k	29,900	30,200	30,400	30,500	1.01	2.4093
8-PEO-50k	52,800	56,800	61,500	60,000	1.08	3.5959
9-PEO-100k	99,500	103,000	107,000	106,000	1.04	5.5959
10-PEO-180k	177,000	193,500	217,000	206,000	1.10	8.7837
11-PEO-270k	273,000	277,000	270,000	290,000	1.02	11.4814
12-PEO-360k	362,000	370,000	374,500	379,000	1.02	14.4727



#	Chromatogram plot:	#	Chromatogram plot:
1-PEO-0.6k:		2-PEO-1k:	
3-PEO-2k:		4-PEO-6k:	
5-PEO-10k:		6-PEO-20k	

#	Chromatogram plot:	#	Chromatogram plot:
7-PEO-30k:		8-PEO-50k	
9-PEO-100k:		10-PEO-180k:	
11-PEO-270k:		12-PEO-360k	

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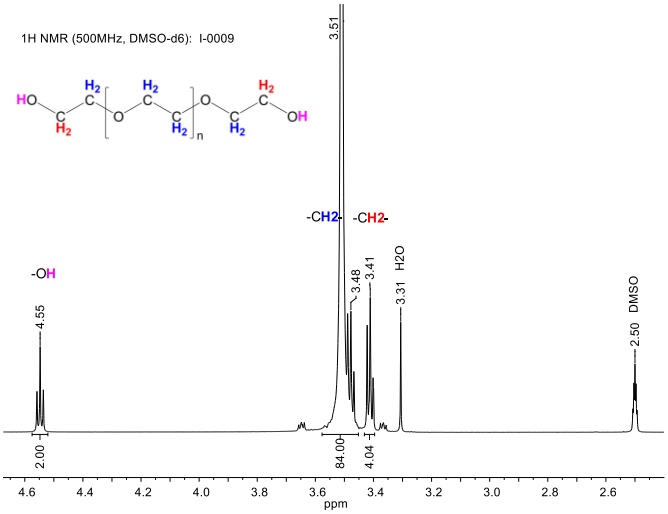
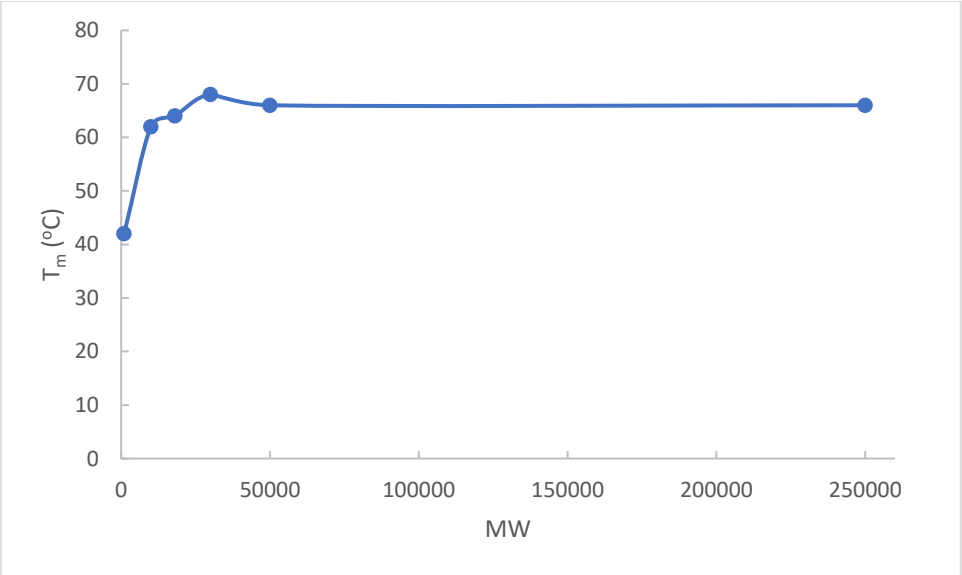
Sample of PEO ^{1}H NMR spectra is presented below.

2-PEO-1k_R0009



Dependence of glass transition temperature (T_g) of PEO 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.

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