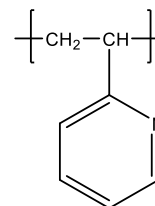




## CERTIFICATE OF ANALYSIS

Product name and structure: **Poly(2-vinyl pyridine)**  
**ISO Certified Reference Material**



PS standards kit number: **R10-3.7k400k-P2VP**

Part numbers:	1-P2VP-3.7k_R1565	6-P2VP-60k_R15017
	2-P2VP-5k_R7543	7-P2VP-100k_R4926
	3-P2VP-10k_R4846A	8-P2VP-150k_R18295
	4-P2VP-15k_R18194	9-P2VP-300k_R18426
	5-P2VP-30k_R18148	10-P2VP-400k_R8431

**PS Certified Reference Material:**

Polymer: Poly(2-vinyl pyridine) (P2VP)  
Chemical formula:  $[C_7H_7N]_n$   
CAS number: 25014-15-7  
Purity: 99.9 %  
Appearance: White solid material  
Production: Poly(2-vinyl pyridine) is synthesized by living anionic polymerization of 2-vinyl pyridine using an adduct of Sec-butyllithium and diphenyl ethylene. Polymerization is carried out in THF at  $-78^\circ\text{C}$ . Polymerization reaction is terminated using degassed methanol.  
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: Agilent Technologies 1260 Infinity II GPC/SEC System  
Detectors: Triple detector (RI, Viscometer, LS  $90^\circ$  and  $15^\circ$ )  
Columns: Three columns (PLgel 5  $\mu\text{m}$ , 10  $\mu\text{m} \times 2$ )  
Solvent (mobile phase): THF with 1% (v/v) triethylamine as the eluent  
Temperature:  $30^\circ\text{C}$   
Flow rate: 1 mL/min  
Injection volume: 100  $\mu\text{L}$   
System calibration: Certified polystyrene narrow standards  
Sample concentration: 1–5 mg/mL  
dn/dc (mL/g): 0.167

\*Abbreviations used in Results:  $M_n$ ,  $M_w$ ,  $M_p$ , and  $M_z$  are the respective number, weight, peak and Z molecular weight averages.  $M_w/M_n$  is the polydispersity ratio.  
 $[\eta]$  is the intrinsic viscosity (in the experimental conditions).

**<sup>1</sup>H NMR Instrument Details and Analysis Conditions:**

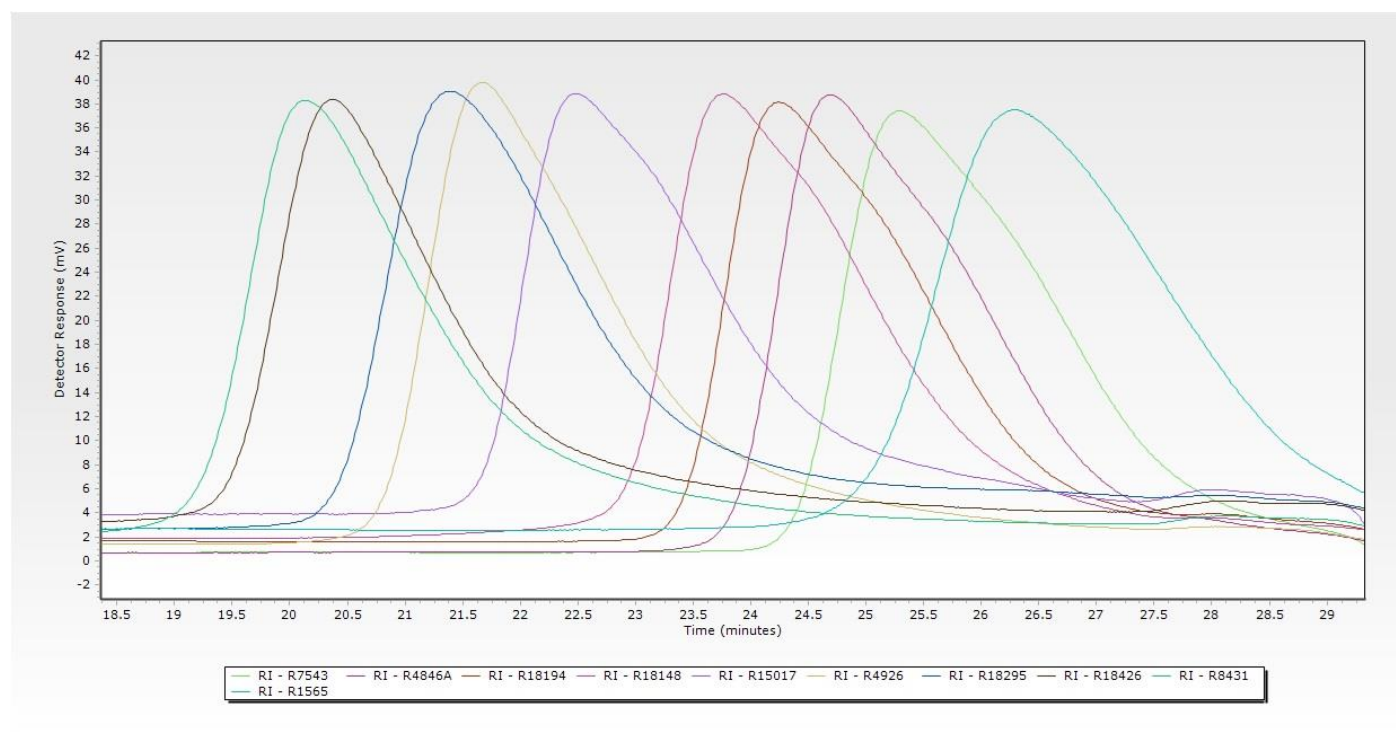
Instrument: Bruker Avance III 500 NMR spectrometer  
Solvent: CDCl<sub>3</sub> (99.8%D)

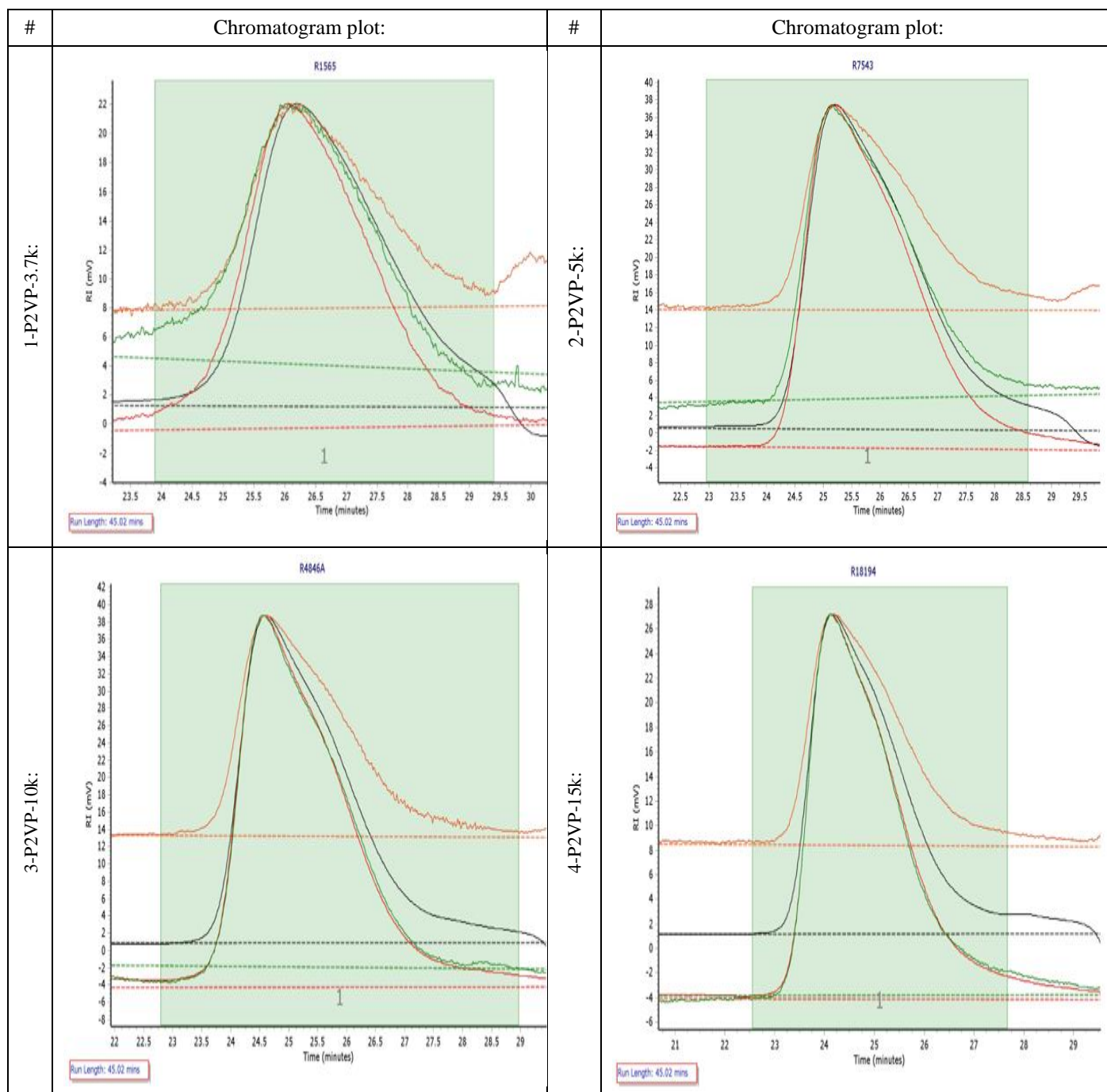
**DSC Instrument Details and Analysis Conditions:**

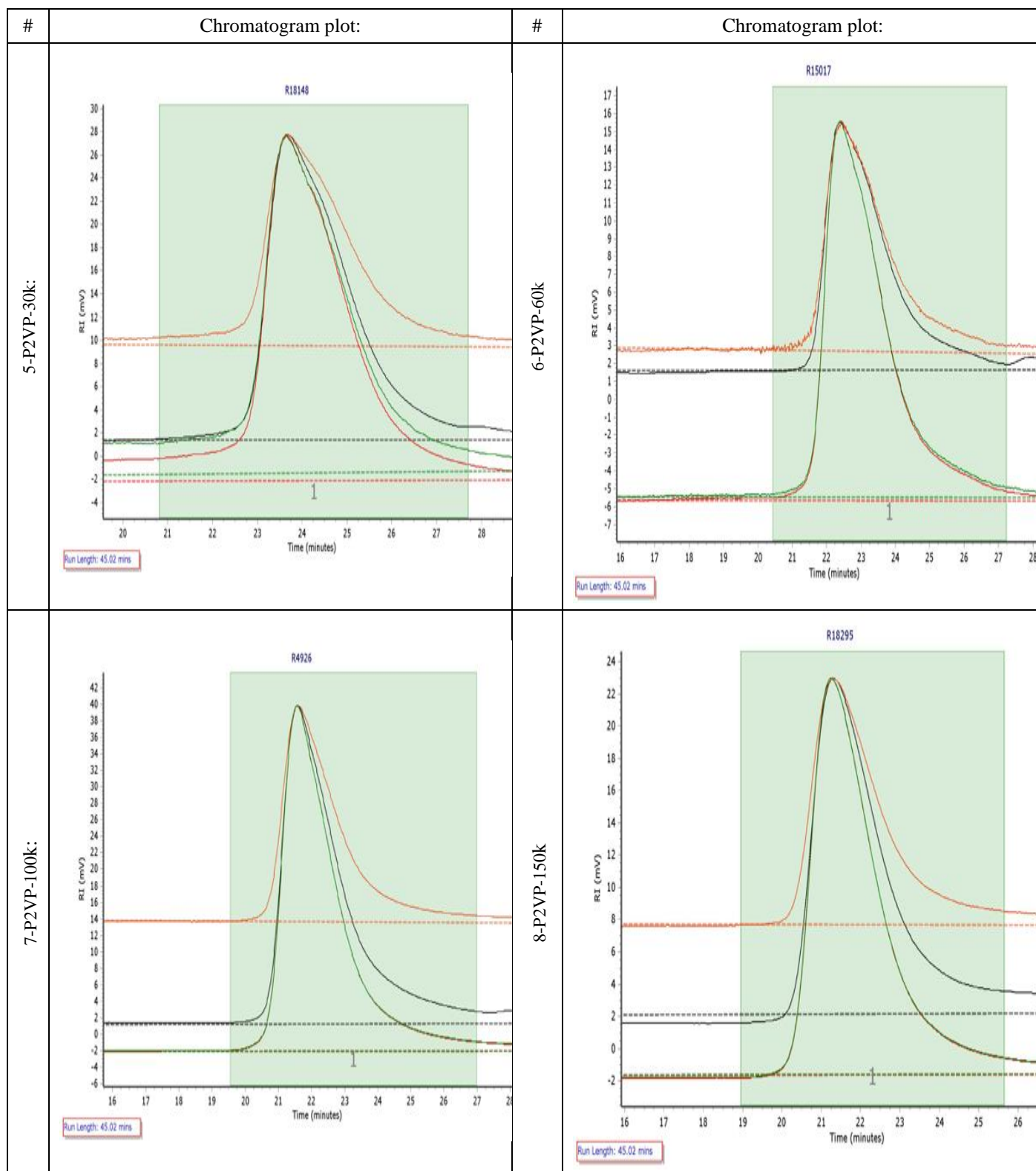
Instrument: TA Instruments DSC Q100  
Gas: Nitrogen  
Thermal analysis: Glass transition temperature (T<sub>g</sub>) was measured at a scan rate of 10°C/min.

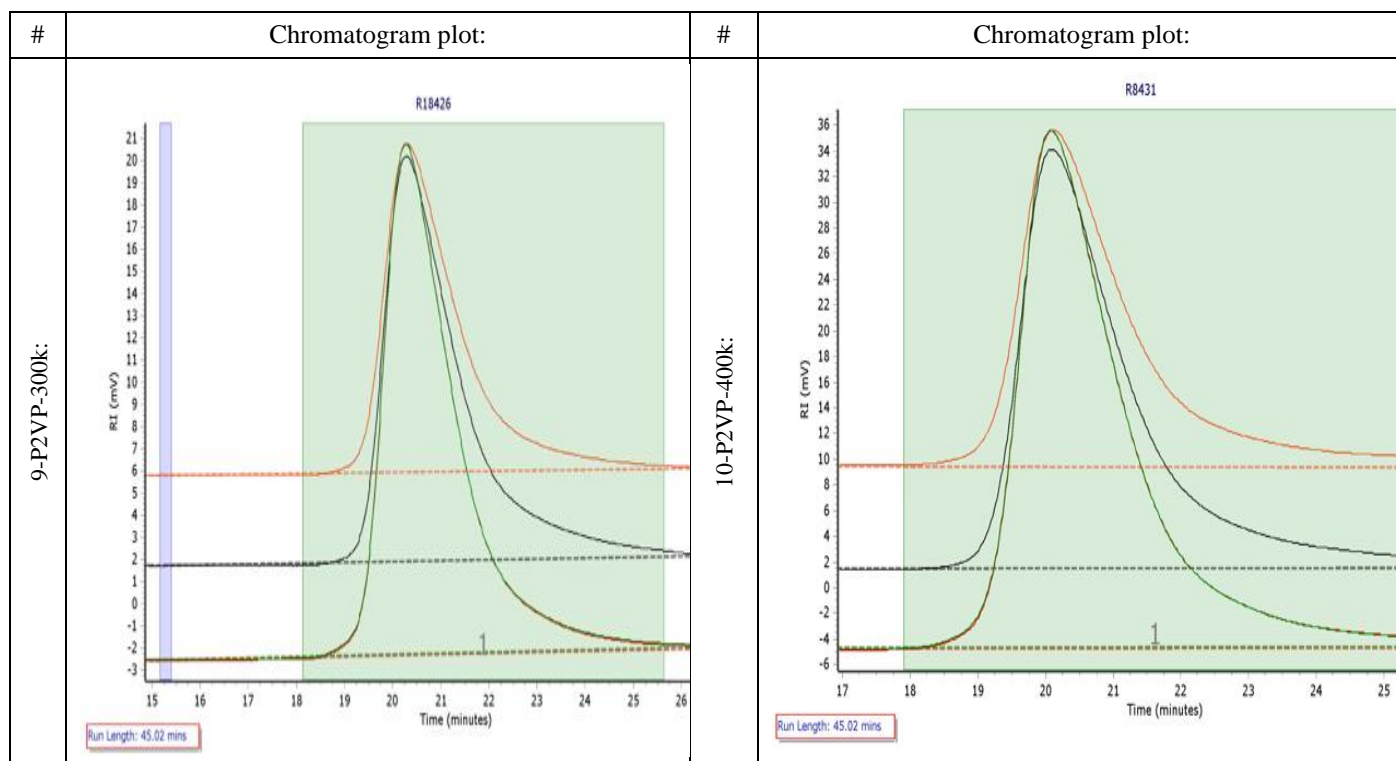
**RESULTS:**

Sample #	GPC/SEC Results					
	Molecular weight averages (g/mol)				M <sub>w</sub> /M <sub>n</sub>	[η] <sub>w</sub> (dL/g)
	M <sub>n</sub>	M <sub>w</sub>	M <sub>p</sub>	M <sub>z</sub>		
1-P2VP-3.7k	3,700	4,300	4,800	4,800	1.15	0.0452
2-P2VP-5k	5,600	5,700	6,100	5,800	1.02	0.0602
3-P2VP-10k	9,500	9,600	10,400	9,800	1.01	0.0832
4-P2VP-15k	16,000	16,000	16,500	16,000	1.00	0.107
5-P2VP-30k	29,000	30,000	32,000	30,000	1.02	0.143
6-P2VP-60k	62,000	63,500	70,000	65,000	1.02	0.239
7-P2VP-100k	109,000	111,000	122,000	113,000	1.02	0.313
8-P2VP-150k	153,000	155,000	166,000	156,500	1.01	0.410
9-P2VP-300k	292,000	302,000	333,000	310,000	1.03	0.592
10-P2VP-400k	387,000	397,000	433,000	405,000	1.03	0.817

**Chromatograms Overlay**

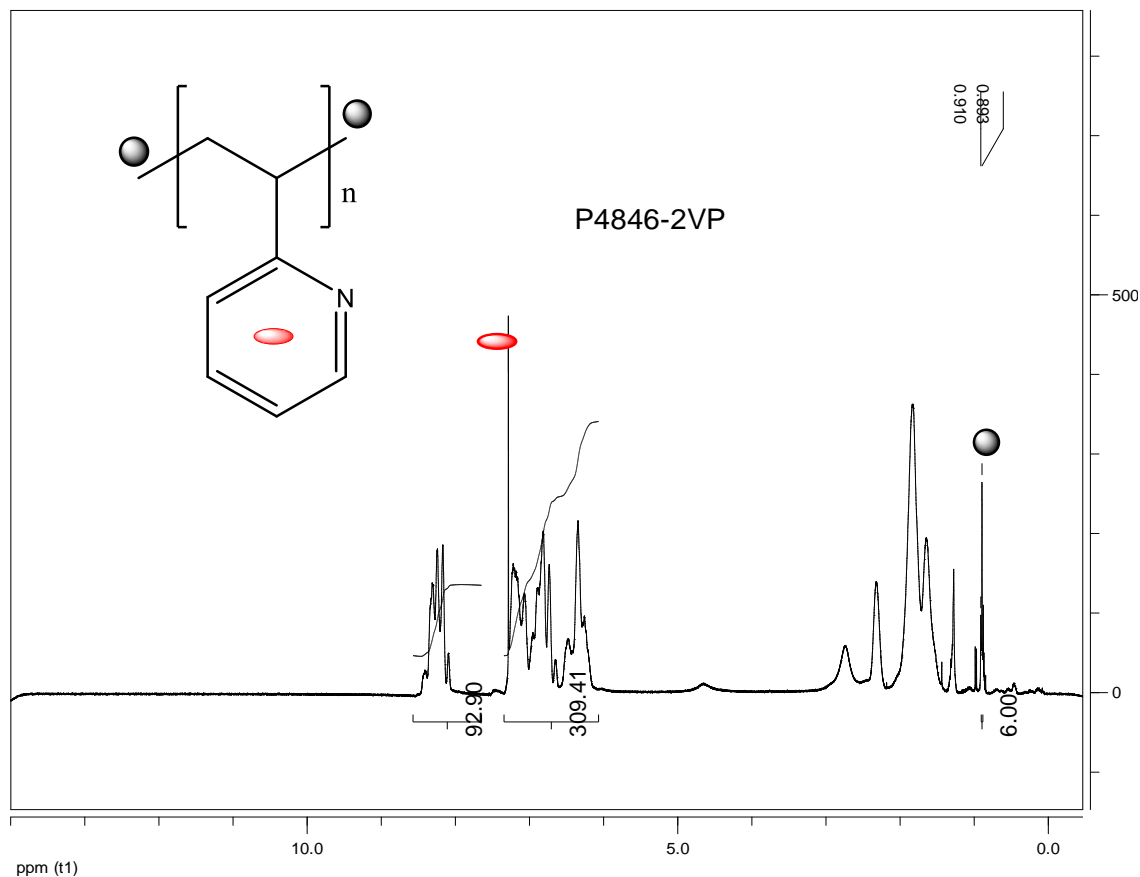




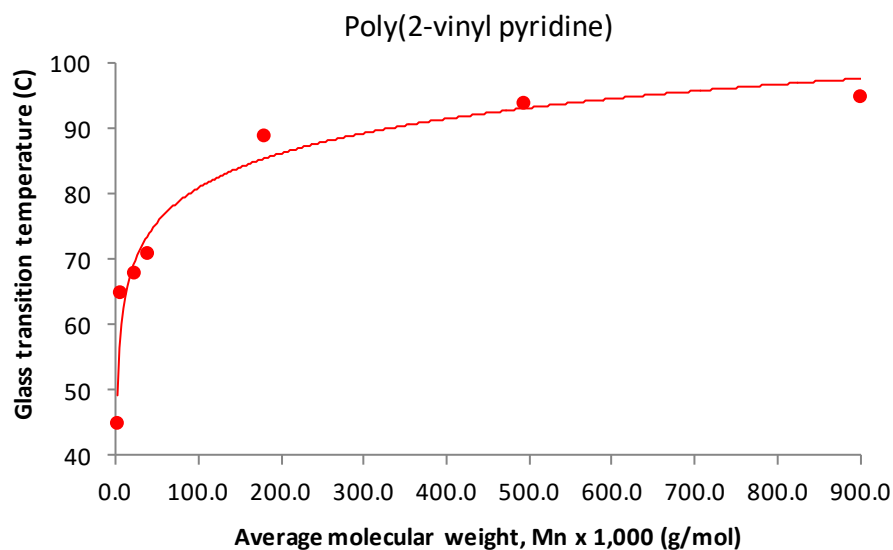


Sample of P2VP <sup>1</sup>H NMR spectra is presented below.

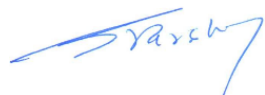
3-P2VP-10k\_R4846A



Dependence of glass transition temperature ( $T_g$ ) of P2VP 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.

