

Sample Name:

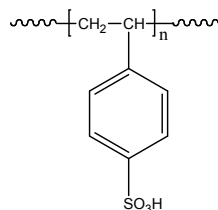
**Poly(4-styrene sulfonic acid)**

**Or Poly(styrene sulfonic acid)**

In dialysed form or undialysed form

**Sample #: P4998-SSO3H (Dialysed form)**

**Structure:**

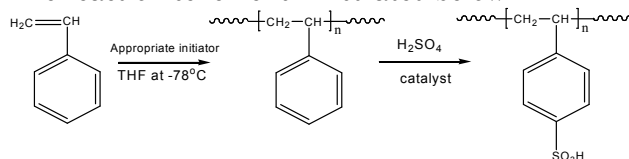


**Composition:**

$M_n \times 10^3$	PDI
88.0	1.04
C:H:S	36.3:5.8:13.2
Degree of sulfonation	>92%
$T_g$ ( $^{\circ}\text{C}$ )	152

**Synthesis Procedure:**

Poly(styrene sulfonic acid) is obtained from the sulfonation of polystyrene. Polystyrene was obtained by anionic living polymerization. The molecular distribution of the obtained polystyrene sulfonic acid remains same as of the parent polymer. Furthermore the HNMR and FTIR spectroscopy of the polymer shows the sulfonation is predominately at par position of phenyl group. The reaction scheme is illustrated below:



**Characterization:**

Size exclusion chromatography (SEC) was carried out on a Varian liquid chromatograph equipped with a refractive detector. For the precursor polystyrene, two columns from Supelco (G4000-2000 HXL) were used with THF as the eluent. The columns were calibrated with monodisperse polystyrene standards. The molecular weight and the polydispersity indice were calculated. For polystyrene sulfonic acid, a column from Supelco (G5000 PWWL) was used with 0.1  $\text{NaNO}_3$  /water as the eluent.

The degree of sulfonation was determined by acid/base titration and by elemental analysis.

**Thermal analysis:**

Thermal analysis of the samples was carried out on a TA Q100 differential scanning calorimeter at a heating rate of  $10^{\circ}\text{C}/\text{min}$ . The midpoint of the slope change of the heat flow plot of the second heating scan was considered as the glass transition temperature ( $T_g$ ).

**Solubility:**

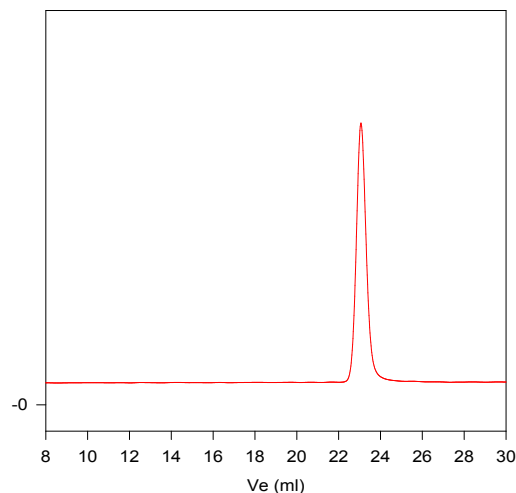
Poly(styrene sulfonic acid) is soluble in methanol, water and precipitated out from the hexane, THF, toluene.

**Dialysis of the Polymer:**

Dialysis was carried out in a membrane (from spectrum Co). The solution was prepared in  $\text{H}_2\text{O}$  (distilled Millipore) and filtered after the dialysis is completed. Normally it was carried out for 3 days. The obtained polymer was freeze dried in water.

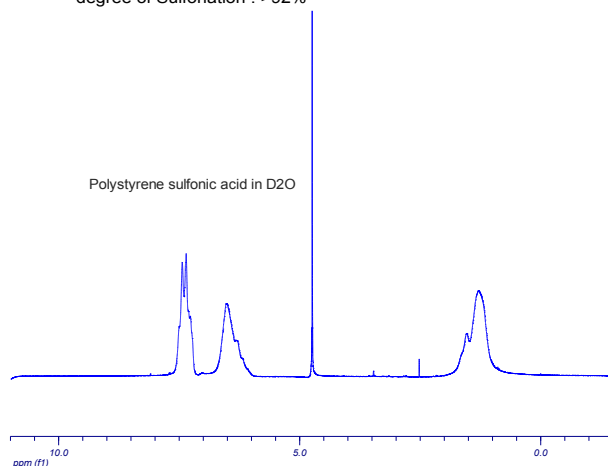
**SEC of Homopolymer:**

**P4998-USSO<sub>3</sub>H**



Size exclusion chromatograph of poly(styrene sulfonic acid-Sodium salt)  
Polystyrene precursor

$M_n=88000$ ,  $M_w=85000$   $PI=1.04$   
degree of Sulfonation : >92%



**DSC thermogram for the polymer:**

