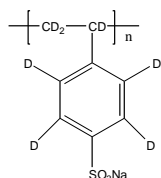Sample Name:
**Deuterated Poly (styrene sulfonic acid soduim salt)**

Sample #: **P4123-dPSSO3Na**

**Structure:**
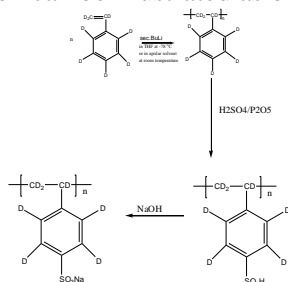


**Composition:**

| Mn x $10^3$ | PDI |
|---|---|
| 70.0 | 1.07 |
| C:H:S(By elemental analysis) 39.68:5.43:11.01 | |

**Synthesis Procedure:**
Deuterated polystyrene-$d_8$ is obtained by living anionic polymerization of styrene-$d_8$. The obtained polymer was sulfonated in the presence of H2SO4/P2O5. The polymerization scheme and the sulfonation can be illustrated as below.



**Characterization:**
Size exclusion chromatography (SEC) was carried out on a Varian liquid chromatograph equiped 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 PWXL) was used with 0.1 NaNO$_3$ /water as the eluent.The degree of sulfonation was determined by acid/base titration and by elemental analysis.
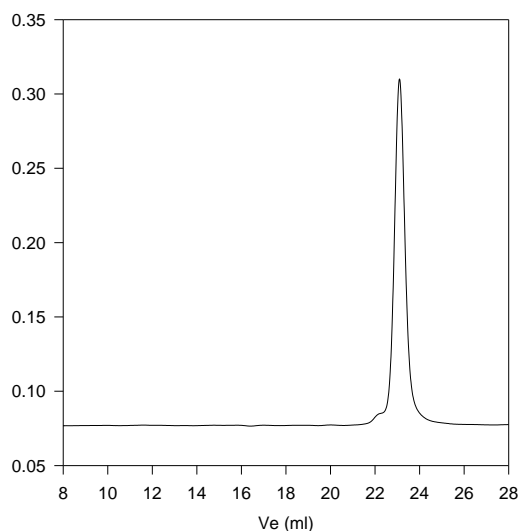
**Solubility:**
Deuterated polystyrene-(d7)sulfonic acid is soluble in water, methanol and ethanol. It precipitates from hexane, toluene, and THF.

**Dialysis of the Polymer:**

Dialysis was carried out in a membrane (from spectrum Co). The solution was prepared in H2O (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: (starting polystyrene)**
**Precursor for P4123-dSSO3H P4110-dPS**



Size exclusion chromatograph of deuterated polystyrene (d8):

$M_n$=42000, $M_w$=45000, PI=1.07
after sulfonation: Mn 63000 Mw/Mn 1.07
Degree of sulfonation by elemental analysis and by titration > 80%
dialysed form
After Neutralization with NaOH: Mn 70,000 Mw/Mn 1.07