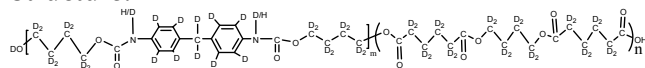


**Sample Name:** Complete deuterated Polyurethane  
**Poly urethane based on Adipic acid, 1, 4 Butane diol and 4, 4'-Methylenebis (phenyl isocyanate)**  
**MDI- based polyurethanes**  
**Sample #:** P19432-dPU

#### Structure:



#### Composition:

| Mw x 10 <sup>3</sup> | Mw/Mn (PDI) | Composition MDI:Oligomers m :n ratio (molar) | Tm (°C) |
|----------------------|-------------|----------------------------------------------|---------|
| 138.0                | 2.5         | 1:4                                          | 54.3    |

**Mn of Oligomers :** Trimer of deuterated d10 Adipic acid and deuterated d10 Butandiol: 18,000  
**Synthesis Procedure:**

Polyurethane is prepared in two-step procedure A: oligomerization of Adipic acid with Butane diol and then B reaction with MDI containing 1,4 butane diol.

| Oligomers (g)                                               | MDI+Butane diol                                                                                                          |
|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| 7.2g<br>Mn 18,000<br>0.8X10 <sup>-3</sup> mole (end groups) | 0.2x10 <sup>-3</sup> mole of MDI and<br>0.2x10 <sup>-3</sup> mole of Butane diol<br>52 mg (MDI) and<br>200mg butane diol |

#### Characterization:

An aliquot of the copolymer was analyzed by size exclusion chromatography (SEC) to obtain the molecular weight and polydispersity index (PDI). The chemical composition was verified by <sup>1</sup>H-NMR spectroscopy, which is run in deuterated chloroform at 500MHz. The glass-transition temperature was measured by DSC.

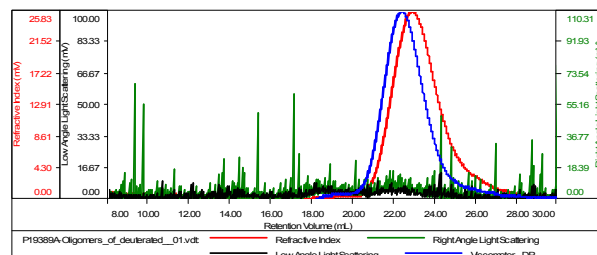
#### Solubility:

| Chloroform (Y) | THF (y) | DMF (Y) | DMSO (Y) |
|----------------|---------|---------|----------|
|----------------|---------|---------|----------|

Oligomer: Characterized in THF at 35 oC:

Oligomers lot# P19389 was used  
**Sample ID:P19389-Oligomer**

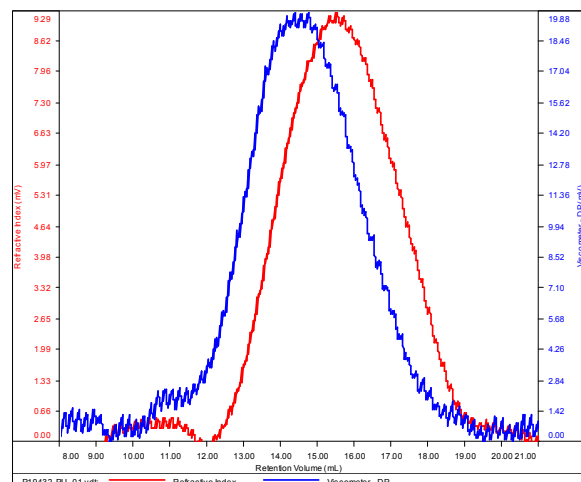
|                       |                            |
|-----------------------|----------------------------|
| Concentration (mg/mL) | 0.9523                     |
| Sample dn/dc (mL/g)   | 0.0700                     |
| Method File           | PS80K-June30-2015-0000.vcm |
| Column Set            | 3x PL 1113-6300            |
| Solvent               | THF                        |



| Sample                                 | MW Number Average (Da) | MW Weight Average (Da) | MW at Peak (Da) | Polydispersity | Intrinsic Viscosity (dL/g) |
|----------------------------------------|------------------------|------------------------|-----------------|----------------|----------------------------|
| P19389A-Oligomers_of_deuterated_01.vdt | 18,153                 | 45,854                 | 19,094          | 2.526          | 2.1761                     |

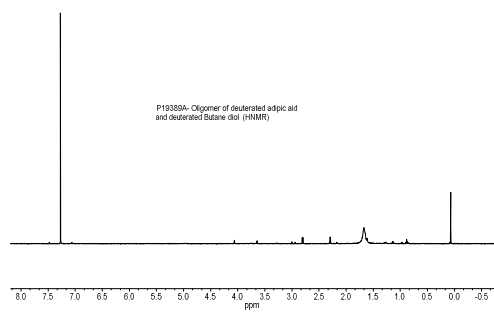
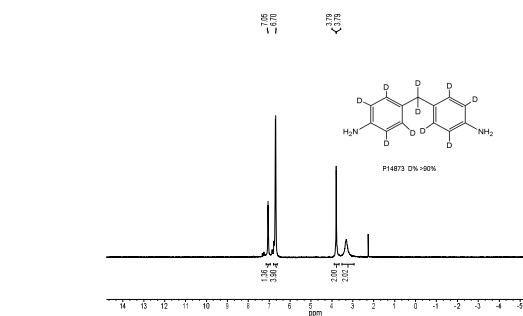
#### SAMPLE ID: P19432-PU

|              |                         |
|--------------|-------------------------|
| Conc (mg/mL) | 1.5902                  |
| dn/dc (mL/g) | 0.0650                  |
| Method       | ps80k-July2015-0000.vcm |
| Solvent      | DMF w 0.03M LiBr        |
| Column       | PSS                     |

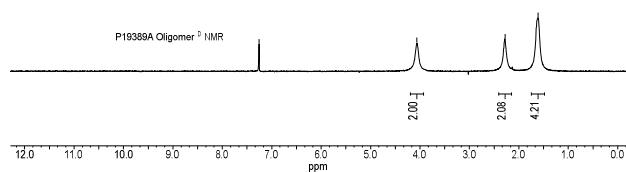
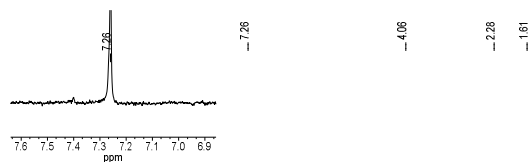


| Sample           | Mn     | Mw      | Mp      | Mw/Mn | IV     |
|------------------|--------|---------|---------|-------|--------|
| P19432-PU_01.vdt | 54,474 | 137,872 | 111,777 | 2.531 | 0.4941 |

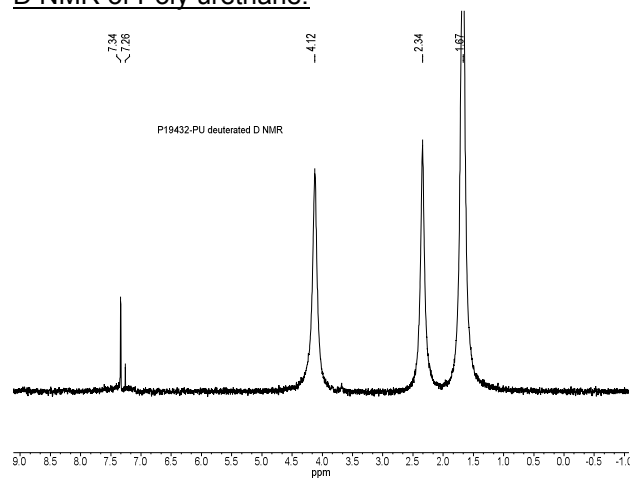
**Figure: <sup>1</sup>H NMR spectrum**  
**Of Deuterated 4,4'-Methylenebis(phenyl diamine)** Used to convert to isocyanate using Phosgene



### D NMR :



### D NMR of Poly urethane:



### DSC Thermogram:

