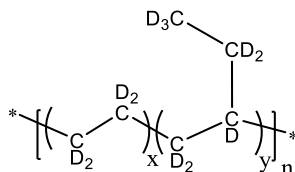


**Sample Name:** Deuterated POLY(ETHYLENE–CO–BUTYLENE)

**Sample #:** P18910A-dEB

**Structure:**



**Composition:**

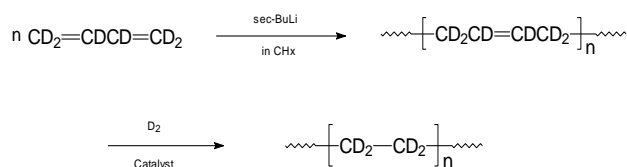
$M_n \times 10^3$ (g/mol)	$M_w/M_n$
137.0	1.06

**Thermal properties:**

Glass transition temperature, $T_g$
36 °C

**Synthesis procedure:**

The polyethylene- $d_4$  was obtained by deuteration of poly(1,4-butadiene- $d_6$ ), which was synthesized by living anionic polymerization of butadiene- $d_6$  in non-polar solvent. The scheme of reaction is presented below:



**Characterization:**

Deuterium NMR spectroscopy was used to confirm the structure of polybutadiene- $d_6$  rich in 1,4-addition.

The complete deuteration of the product was confirmed by FT-IR spectroscopy analysis by disappearance of alkene double bond ( $\text{C}=\text{C}$  at  $971 \text{ cm}^{-1}$ ).

The molecular weight and polydispersity index were obtained by size exclusion chromatography (SEC) of poly(1,4-butadiene- $d_6$ ) precursor using THF as an eluent; and the molecular weight of polyethylene- $d_4$  was calculated accordingly.

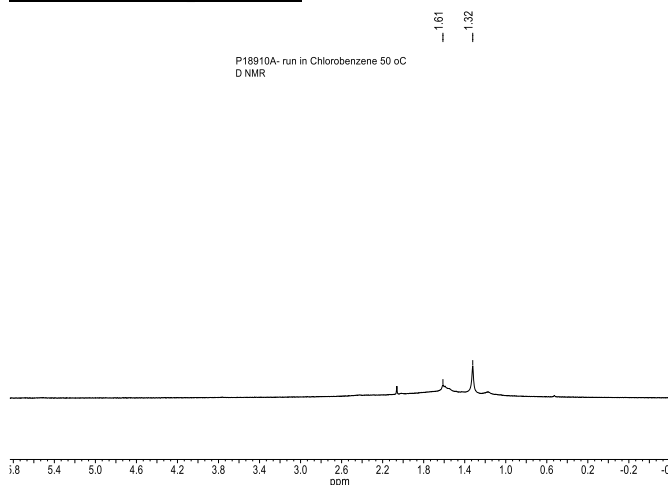
Thermal analysis was performed on TA Instruments Q100 differential scanning calorimeter (DSC) under a nitrogen atmosphere at a scan rate  $10 \text{ °C/min}$ .

**Solubility:**

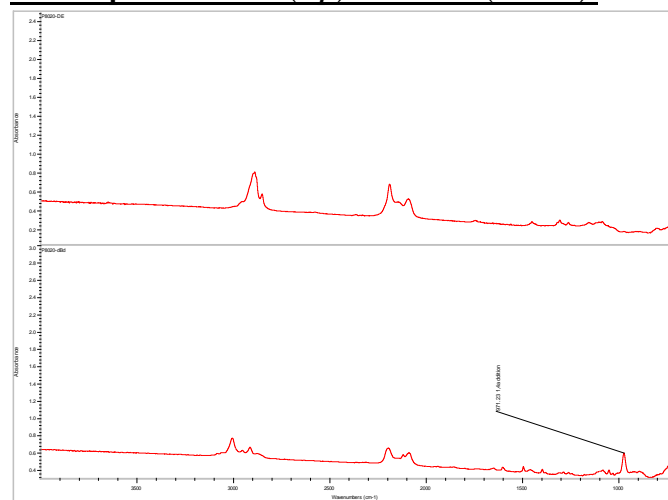
Polyethylene- $d_4$  is soluble in hot toluene and xylene. The obtained solution has light ivory color; this coloration is due to the presence of trace amount (we expect  $<5\text{--}6$

ppm) of the Wilkinson catalyst used in synthesis (and which is hard to remove from the final product).

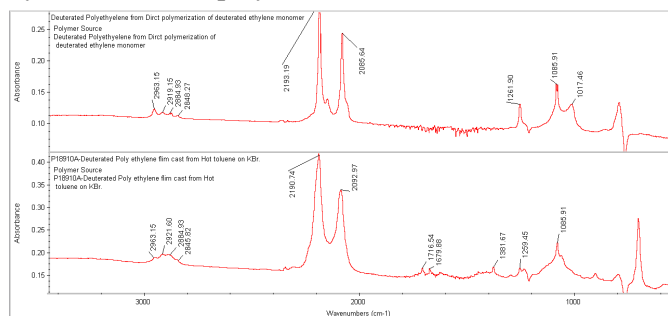
**D ( $^2\text{H}$ ) NMR spectrum:**



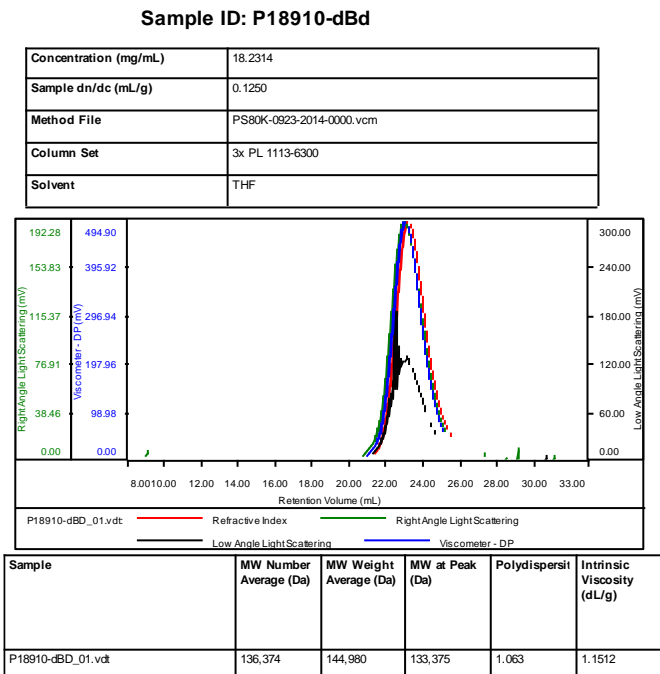
**FT-IR spectra of dPE (top) and dPBd (bottom):**



FT-IR spectra of the deuterated polyethylene- $d_4$  products obtained by direct polymerization of ethylene- $d_4$  monomer using coordination catalyst system [top] and by deuteration of poly(1,4-butadiene- $d_6$ ) [bottom]:



SEC chromatogram of dPBd precursor:



DSC thermograms of the P18910A-dE product:

1<sup>st</sup> cooling (upper) and 2<sup>nd</sup> heating (lower) scans, both performed at a rate 10 °C/min.:

