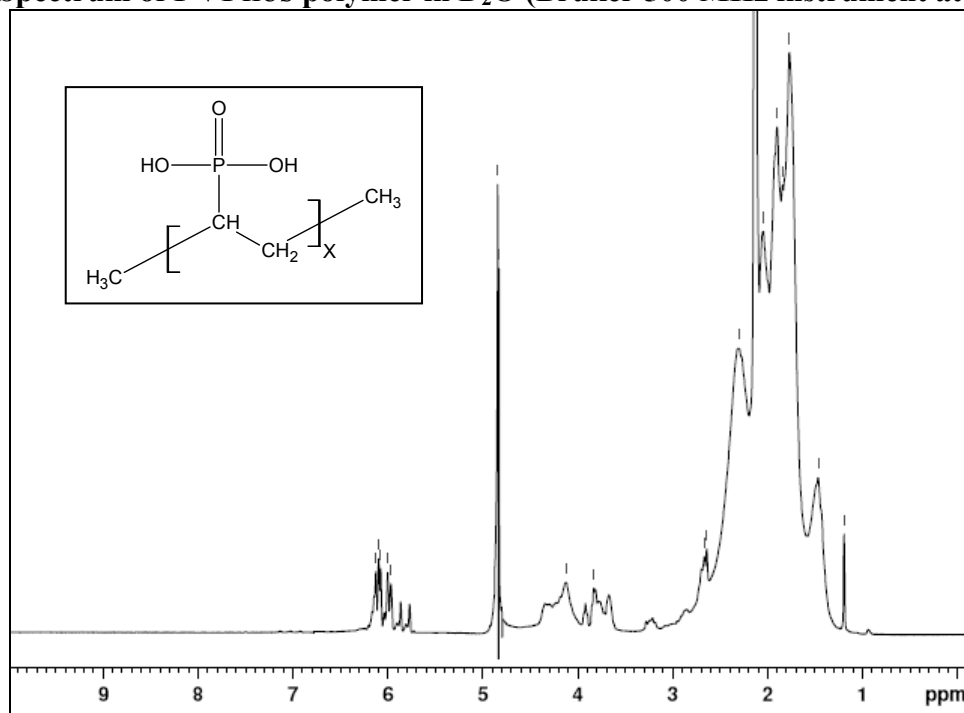


# No. PVPhos1

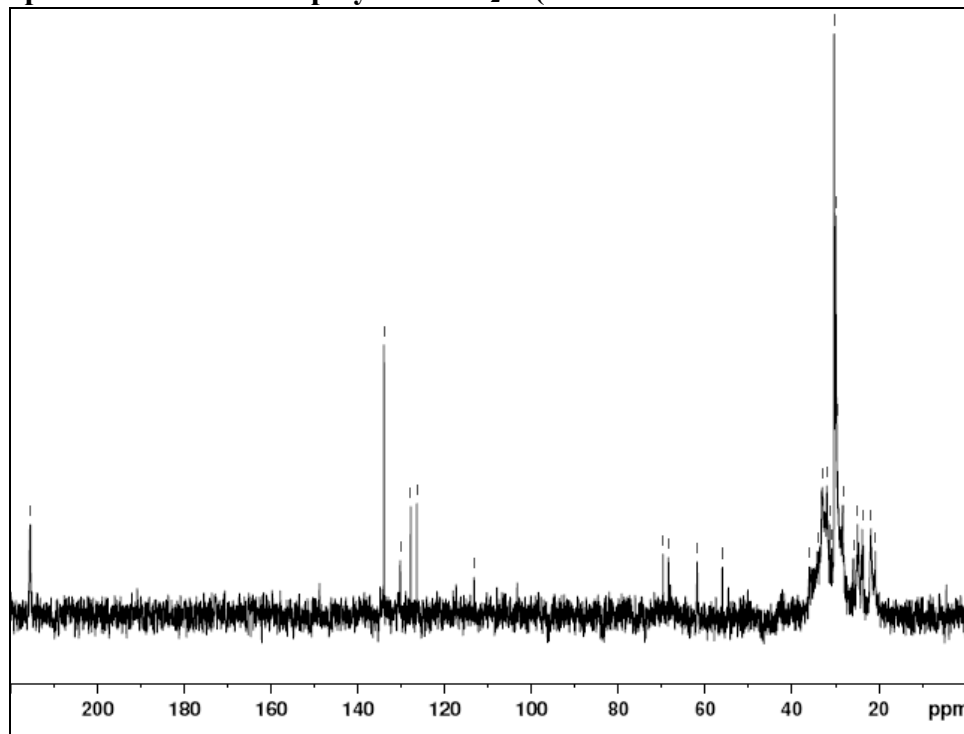
# Certificate of Analysis

Product Name: Poly(vinyl phosphonic acid) (PVPhos)

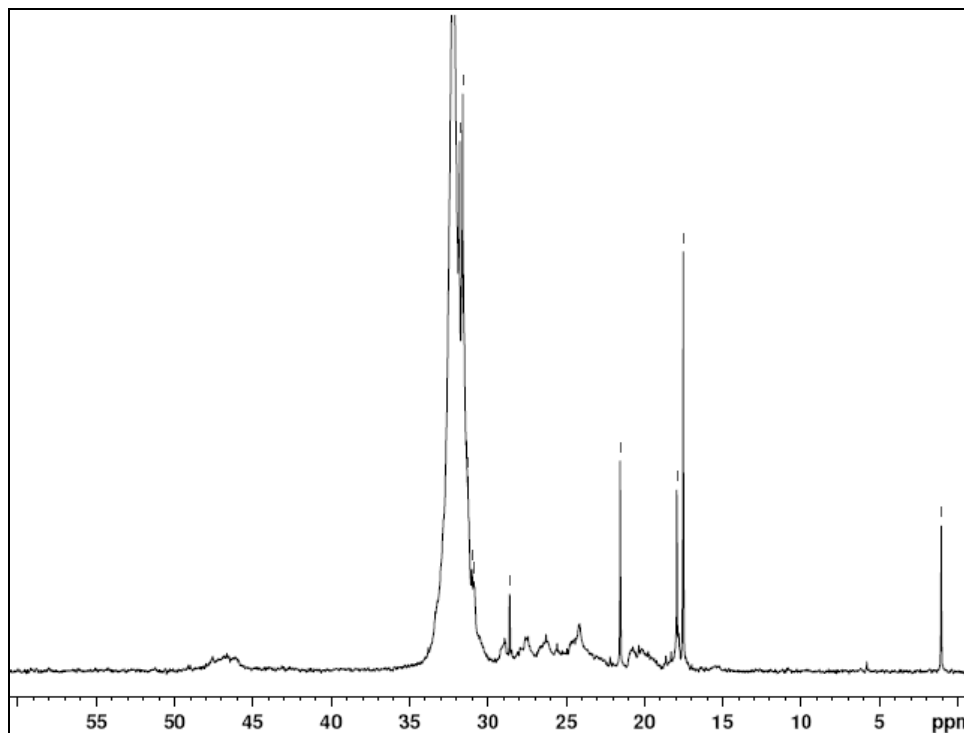
- $^1\text{H-NMR}$  Spectrum of PVPhos polymer in  $\text{D}_2\text{O}$  (Bruker 500 MHz instrument at 315K)



- $^{13}\text{C-NMR}$  Spectrum of PVPhos polymer in  $\text{D}_2\text{O}$  (Bruker 500 MHz instrument at 315K)



- $^{31}\text{P-NMR}$  Spectrum of PVPhos polymer in  $\text{D}_2\text{O}$  (Bruker ARX-400 at RT)



- Inherent Viscosity (IV) of Poly(vinyl phosphonic acid)**

Analysis Method: testing performed with a Cannon-Manning Ubbelohde type Semi-Micro calibrated viscometer (size 50 No C286). Sample was 3 x 0.5 ml of 1g/dl P(VPhos) in DMSO tested at 30°C. Each sample IV determined in triplicate. Values shown are mean  $\pm$  95% confidence (t-test).

Sample	Inherent Viscosity
Poly(vinyl phosphonic acid)	$0.05 \pm 0.02$