

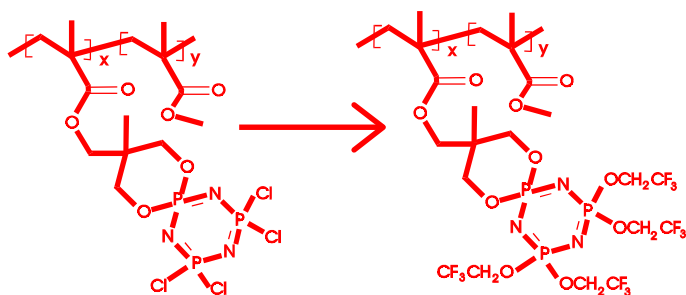
### Detectors

Viscotek Laser Refractometer  
 Viscotek Differential Viscometer  
 Viscotek RALLS Detector

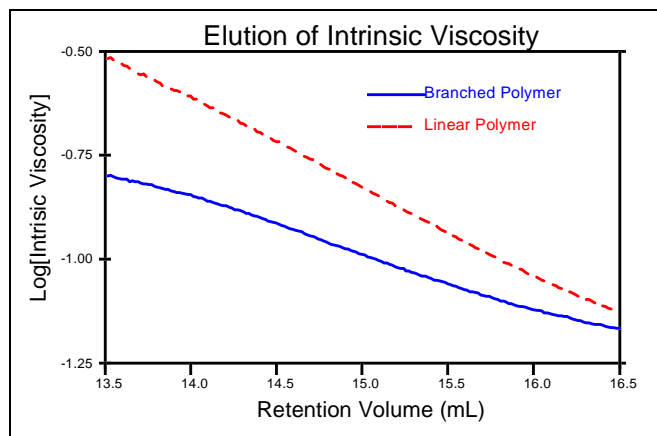
The SEC<sup>3</sup> Triple Detector system is ideal for polymer structure analysis because it directly detects changes in polymer structure as well as molecular weight, whereas conventional methods detect only differences in hydrodynamic size.

The addition of groupings along a molecule's backbone can lead to both a heavier repeat unit and chain transfer within or between molecules. The following system shows an inherent amount of branching growth as well as a degree of heaviness along the backbone.

The drawings below illustrate a methylmethacrylate-based copolymer structure.<sup>‡</sup> The polymer was modified to allow both a heavier backbone and sites available for branching:



Separate plots of the primary triple detector data are shown as follows to illustrate the effectiveness of the triple detector system: the figure below shows that the polymer intrinsic viscosity versus elution volume is much lower for the branched polymer than the linear reference polymer. The inverse relationship between intrinsic viscosity and molecular density is well demonstrated.



### Run Conditions

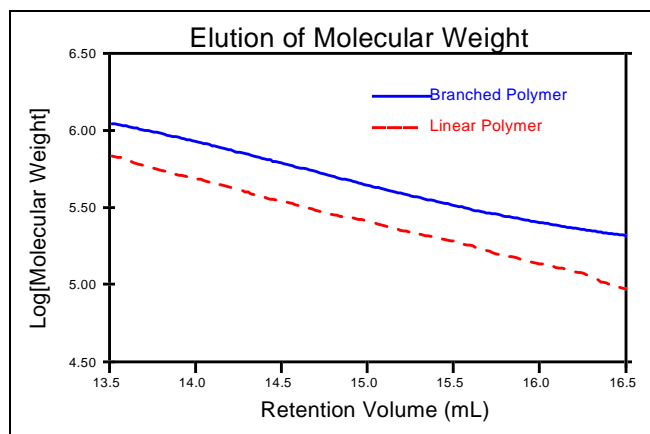
Solvent: THF  
 Columns: 2 -10 $\mu$  Linear Mixed Bed  
 Concentration: 9.7 mg/mL  
 Injection Volume: 100  $\mu$ L  
 Flow Rate: 1.00 mL/min

The following figure shows that the molecular weight of the branched polymer is greater than that for the linear polymer throughout the range of elution volume. This is directly related to hydrodynamic size, as shown:

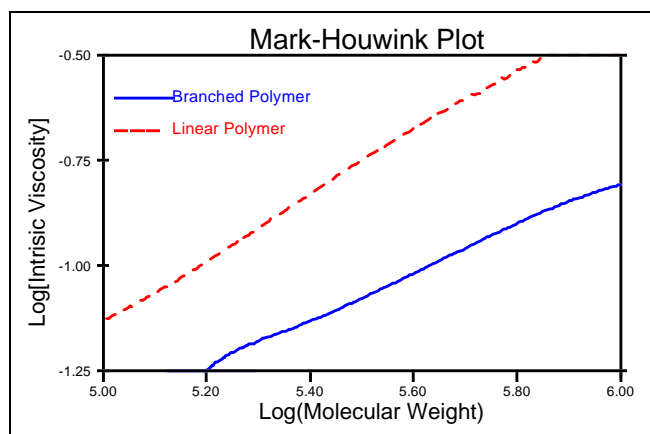
### Viscometer x Light Scattering $\rightarrow$ Elution Volume

$$IV \times M \rightarrow V_h$$

$$\frac{dL}{g} \times \frac{g}{mole} \rightarrow \frac{dL}{mole}$$



By examining the Mark-Houwink plot shown below for this polymer system, it can be seen that the branched analog has both a lower slope and intercept than that of the linear polymer. The lower slope confirms the presence of branching, and the lower intercept confirms the presence of backbone modification.



<sup>‡</sup> Obtained from Christopher W. Allen, University of