

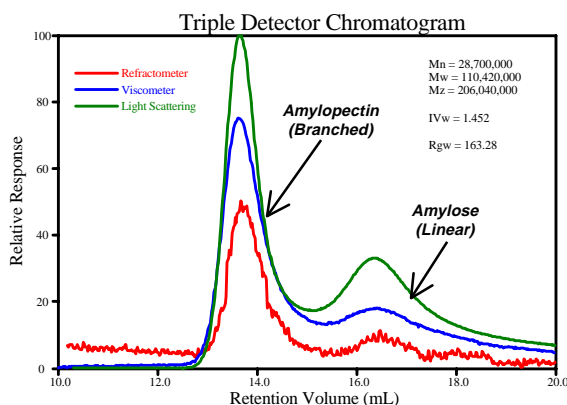
Run Conditions

Solvent: Aqueous with 0.05 M Sodium Hydroxide
Columns: 2 -10µ Ultrahydagel
Concentration: 0.1% (weight/volume)
Injection Volume: 100 µL
Flow Rate: 1.00 mL/min

Many individual techniques have been used in the past for starch analysis:

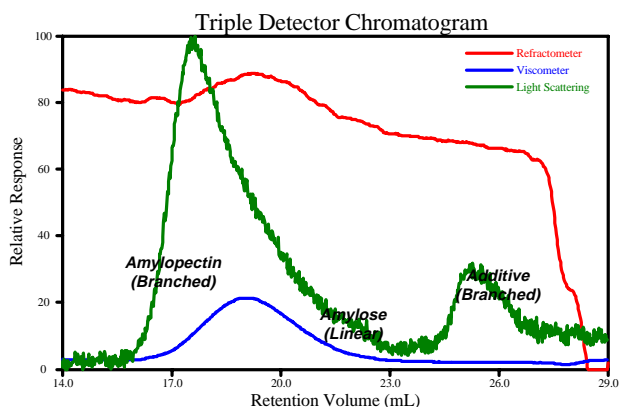
- Chromatography (RI Detection)
- Batch Viscosity Analysis
- On-Line Viscometry Analysis
- Batch Light Scattering Analysis

Each has its own unique advantage. But the combination of refractive index detection, viscometry and light scattering detection with size exclusion chromatography provides all information together for an integrated approach to starch analysis.



The SEC³ Triple Detector system is ideal for starch structure analysis because it directly detects changes in polymer structure as well as molecular weight, whereas conventional methods detect only differences in hydrodynamic size.

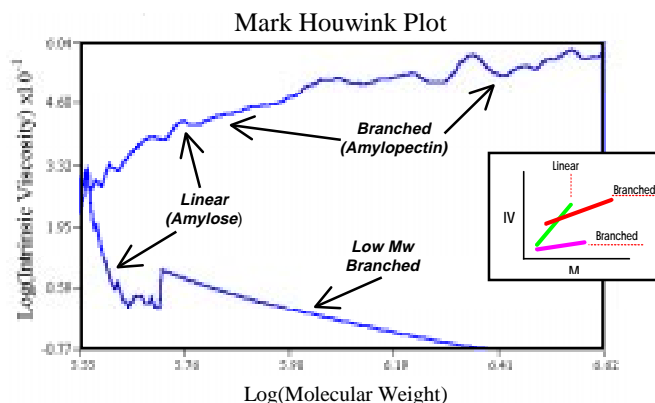
Three different species of a chemically modified starch are clearly shown in the chromatogram below.



Detectors

Viscotek Laser Refractometer
Viscotek Differential Viscometer
Viscotek RALLS Detector

The relationship between intrinsic viscosity and molecular weight is clearly evident in a Mark-Houwink plot.



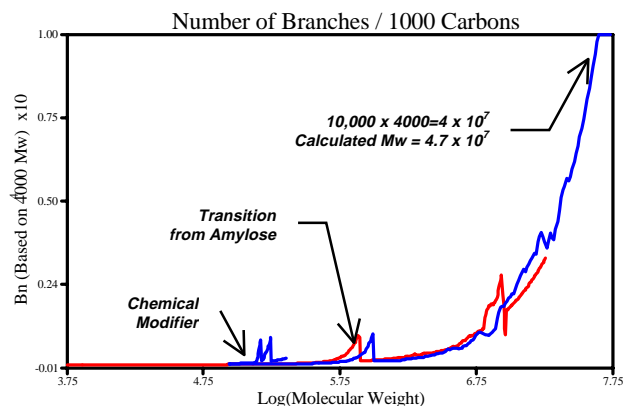
Inversion of the Mark-Houwink plot above is caused by branched-linear-branched fractions. The different slopes of the three species indicate different levels of branching. This is directly related to hydrodynamic volume, as shown:

Viscometer x Light Scattering → Elution Volume

$$IV \times M \rightarrow V_h$$

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

The amount of branching can be determined using the SEC³ Triple Detector System. Overlays of branching plots yield much information about starches, as seen below:



Amylose can be used as a linear reference. Since starch lies close to the column elution limits, branching accuracy increases without column referencing.