

Hydroxyethylstarches (HES)

Hydroxyethylstarches (HES) are used increasingly as plasma expanders in medical applications. The HES' circulation time in the blood depends strongly on its molar mass distributions. Historically, polysaccharide characterization by Gel Permeation Chromatography (GPC) has been problematic, especially if high molar mass components are present. Due to its superior separation capability, especially on molecules exceeding 50kDa, Flow Field-Flow Fractionation (Flow-FFF) is an excellent separation alternative. By coupling this technology to a Multi Angle Light Scattering (MALS) detector, such as a DAWN or mini-DAWN, absolute values can be determined without making any assumptions.

We characterized 0.2% (w/v) HES solutions in doubly-distilled water. The HES types were 200/0.5, 130/0.42 and 70/0.5 from Serumwerk Bernburg, Germany. The FFF system was an Eclipse connected to a DAWN EOS and an RI detector (Shodex 101). Volumes of 100µl were injected into the 350µm spacer channel containing a 10kDa regenerated cellulose membrane. A channel flow of 1ml/min was kept constant while the cross flow decreased linearly from 2ml/min to 0ml/min within 20 minutes. Data were evaluated using Wyatt's ASTRA software package.

The aF-FFF/MALS fractograms of the HES types are compared in Figure 1. Corresponding to normal mode Flow-FFF theory, samples with smaller average molar mass elute faster. In Figure 2 the molar mass distributions are given as cumulative weight fraction plots. As is evident in the plots, monomodal distributions were successfully achieved. The values covered a range from approx. 20kDa to approx. 600kDa and up to 2GDa in size, depending on the characterized HES type. Thus, the average molar mass value was mainly influenced by high molar mass fractions. This was also indicated by higher polydispersity values for HES types with higher molar mass.

Asymmetrical FFF/MALS is, therefore, an excellent method for characterizing medical polysaccharides such as HES. The main advantage of this technique is that molar mass distributions can be determined from absolute values over an extremely wide range of masses.

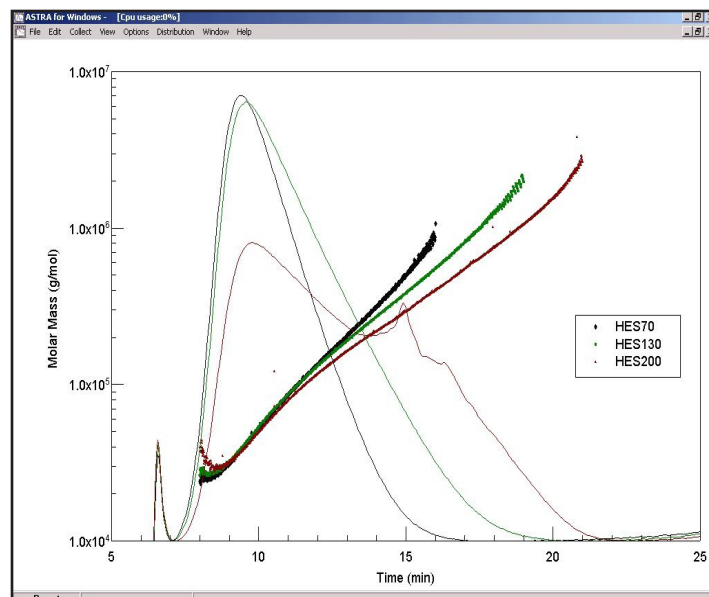


Figure 1. The fractograms of the three samples with their molar mass values overlaid.

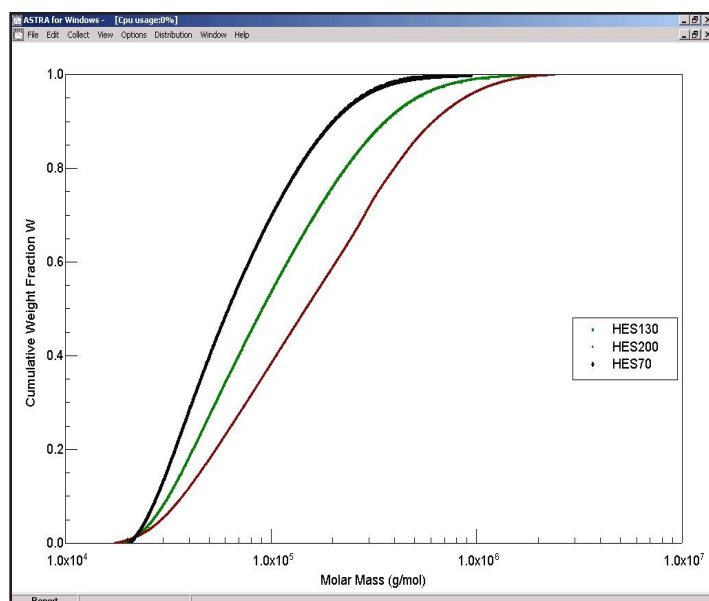
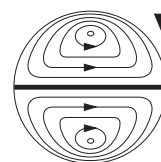


Figure 2. Three different HES samples shown on the cumulative weight fraction plot of ASTRA, indicating the large differences among them.

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