Amylopectin

In this note, we have investigated the behaviour of acidified mixtures of milk proteins and amylopectin, derived from potato and tapioca starch.

When mixed together at sufficiently high concentrations, mixtures of milk proteins (casein micelles) and amylopectin will phase separate due to depletion flocculation mechanisms. When such a mixture is acidified (e.g. by fermentation with lactic acid bacteria), due to acid-induced gelation of the milk proteins, the phase-separated mixture will be "frozen" in a metastable state. The actual microstructure of such a mixture (and also the textural properties) depends on several parameters, one of which is the molecular size of the amylopectin molecule. By varying the molecular weight (and radius of gyration) of the used amylopectin, different textures and morphologies can be obtained.

To characterize the molecular mass and radius of gyration of the amylopectins, we used a Wyatt miniDAWN sytem, in conjunction with refractive index detection. The samples were eluted with simulated milk serum as eluent, at a flow rate of 1 mL/min (at 40°C), using 2 coupled 300mm PLaquagel-OH mixed-bed gel filtration columns.

A typical experiment (see graphs) shows that the amylopectin is very polydisperse (10^4-10^7 g/mol). Nevertheless, separation on our GPC-system seemed fair. The following data were calculated:

$$M_n = 73 \text{ kDa}$$
$$M_w = 468 \text{ kDa}$$
$$M_n/M_w = 6.4$$

A reliable calculation of R_w was only possible for the part of the chromatogram where the LS signal was strong enough (13-16.3 mL). For this part of the sample, a weight-averaged radius of gyration of 23 nm is calculated (and M_w = 740 kDa). The relatively small radius of gyration (in combination with a high molar mass) is in agreement with a highly branched molecular structure, as is true for this amylopectin molecule.

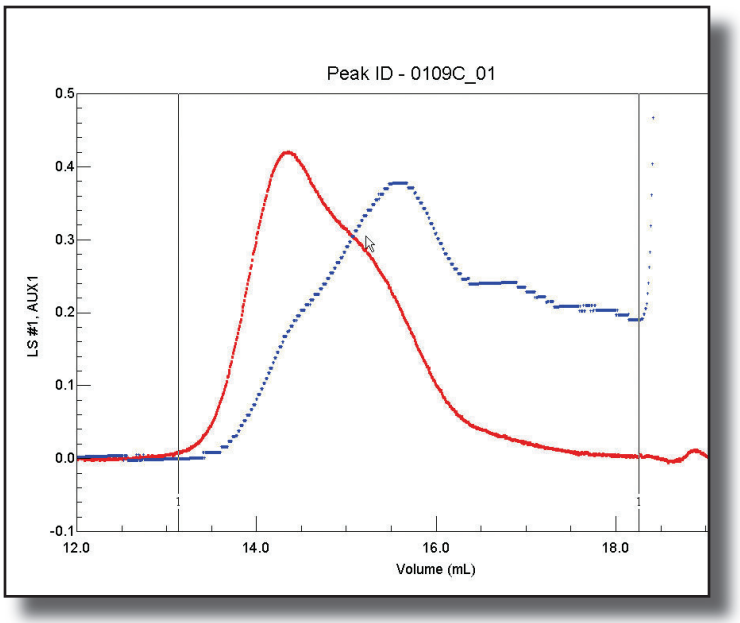

Figure 1. A representative light scattering peak overlaid on the RI peak.

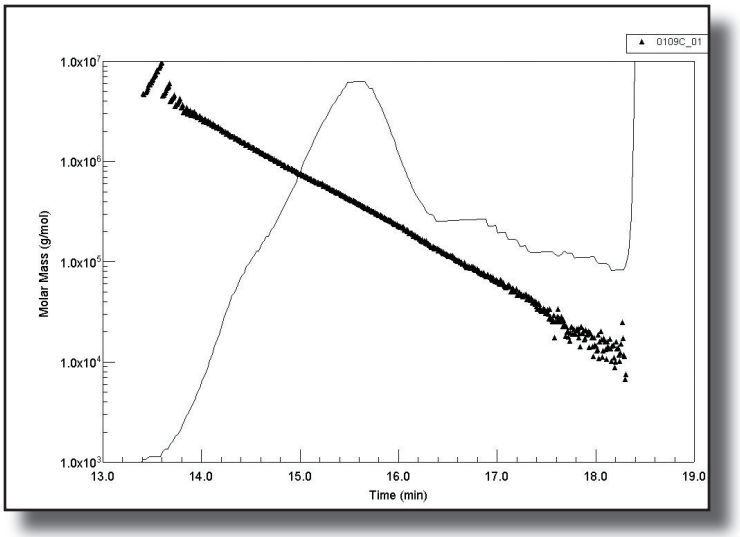

Figure 2. The calculated Mass versus volume of the amylopectin across the peak.

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