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Experiment Report Form

Instructions for preparing your Report

- fill in a separate form for each project or series of measurements.
- type your report, in English.
- include the reference number of the proposal to which the report refers.
- make sure that the text, tables and figures fit into the space available.
- if your work is published or is in press, you may prefer to paste in the abstract, and add full reference details. If the abstract is in a language other than English, please include an English translation.

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DUBBLE	**Experiment title:** : **Complex Coacervation of whey proteins and acacia gum: internal structure of the coacervates**	**Experiment number**:26-02-208
Beamline: BM26B	**Date(s) of experiment**: From: 12-09-2003 To: 15-09-2003	**Date of report**: 09-2003
Shifts: 9	**Local contact(s):** W. Bras, S. Hoffman	

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Report

Complex coacervation of whey proteins and gum Arabic: internal structure of the coacervates.

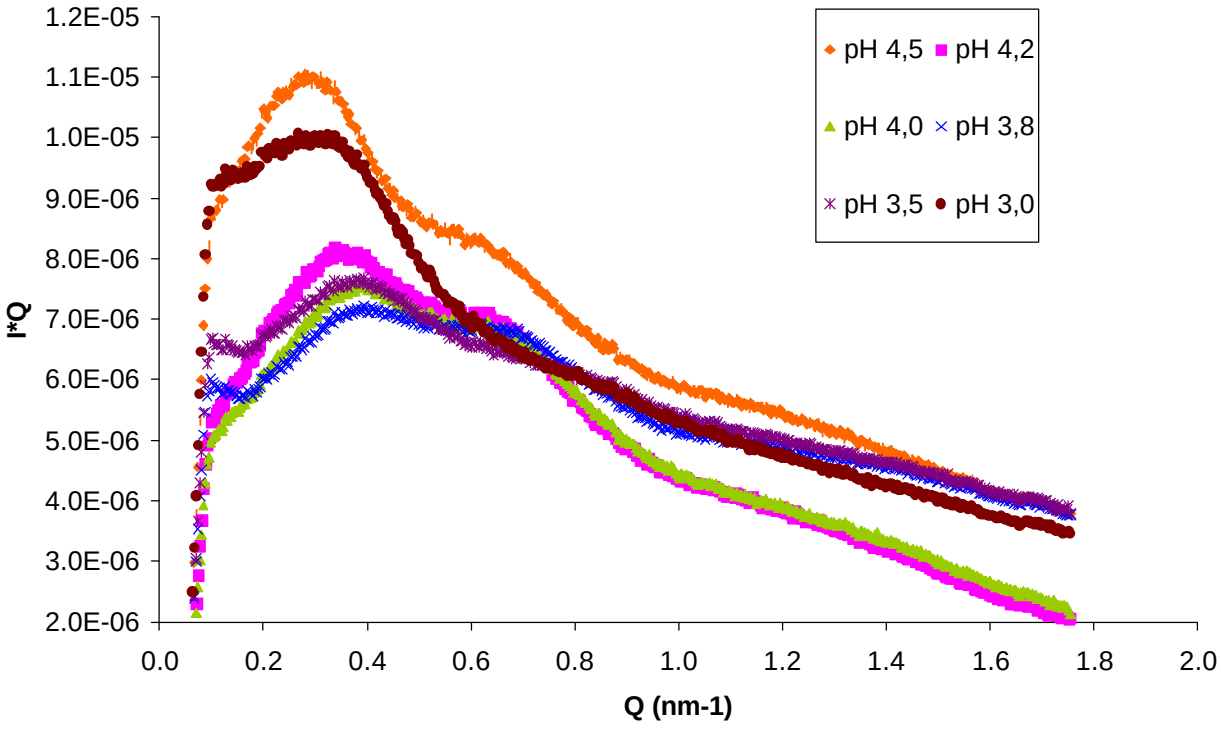

Figure 1: Holzer Plot of whey protein / gum arabic coacervates as a function of pH

Aim .

The aim of the SAXS experiments was to study the internal structure of the whey proteins (WP) / gum Arabic (GA) coacervates at various pH's, ionic strengths, and protein to polysaccharide ratios.

Results.

This study can be divided in three parts:

1. Effect of pH
2. Effect of salt
3. Effect of protein to polysaccharide ratio

1. The formation of WP/GA coacervate arises from the electrostatic interactions between the polymers. This interaction is strongly pH dependant, as it was determined in previous studies. Thus, as presented in figure 1, varying the pH leads to a variation of the internal structure of the coacervate. The strength of interaction is maximal at pH 4.0, pH at which the scattering data shows the most structured sample. Indeed for the sample at pH = 4.0, the smallest length scale highlights a dense, compacted coacervate phase. Moreover, a peak at Q = 0.7 nm^{-1} , typical of the length scale of the WP, shows that the coacervate is a close packed structure.
2. In further experiments, we studied the influence of salt (NaCl) addition on the coacervate structure. Adding salt weakens the interaction between WP and GA, which leads to a more open structure of the coacervate phase. Indeed, by increasing salt concentration, the pattern at low Q shifts to higher intensity, which means that the coacervate phase becomes less dense and more "porous" like.
3. Finally, a different protein to polysaccharide ratio was measured and it seems that the pH at which the most structured sample occurs varies as a function of the ratio. For a ratio 1:1, the optimum pH was found around 3.5, which is understandable, since at lower pH, the proteins are more charged and if less proteins are available per GA chain, the charge compensation will occur at lower pH..

Conclusions

SAXS is a suitable technique for studying the structure of the WP/GA coacervates. We could clearly show the dependence of scattering pattern as a function of pH, salt, and protein to polysaccharide ratio. These results combined with results of diffusing wave spectroscopy, kinetics and light scattering experiments will lead to one or two papers. Finally, a few preliminary experiments were performed on a film made of WP/GA coacervates. The results are promising and additional experiments are needed.