

Time-Dependent Light Scattering Studies

Aggregation and disaggregation processes of supermolecular structures often take place in time intervals that interfere with the time needed for a measurement of the angular dependence scattering curve by goniometer type instruments. This results in inconsistent scattering curves, as measurements for different angles are taken at different times.

Wyatt Technology's MALS instruments solve this problem by simultaneously measuring the entire angular range. Complete scattering curves *vs.* time can be produced quickly and efficiently. To achieve this optimal configuration, the DAWN EOS in our lab has been slightly modified.

Combining the advantages of this instrument, the use of standard scattering cuvettes, some additional equipment and further development of our software package, LISA, yields a most effective tool for examining time-dependent phenomenon. As a result, we are able to observe the full time-dependence of processes such as aggregation and disaggregation, swelling, dissolution, structure modifications, particle formation, particle growth, and polydispersity changes.

Polyelectrolyte complexes (PECs) are of high practical relevance, ranging from large-scale industrial uses to special purpose applications in biotechnology and medicine. An important feature in *all* applications is PEC's sensitivity to environmental changes, especially when salt conditions are altered. By adding sodium chloride, PECs with carboxylic groups containing polyanions show swelling, aggregation and, finally, dissolution at a critical salt concentration.

For our experiments we used NaPMA as polyanion, PDADMAC, or a copolymer as polycation and proceeded as follows: PEC prepared in pure water, salt added to the desired ionic strength, and then the light scattering studies.

A detailed analysis of the scattering curves provided structural parameters like particle mass, radius and structure density and offers the chance to distinguish between the time dependence of the processes of swelling, secondary aggregation and complete dissolution of the PEC particles.

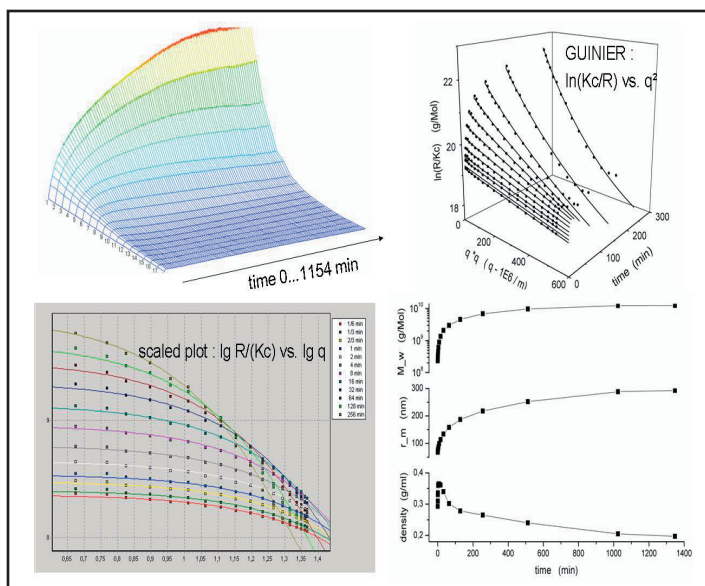


Figure 1. Different views of the data showing the progression of scattering from 0 to 1154 minutes. with salt added (0.1N NaCl) polydisperse systems of spheres used for fitting (full lines).

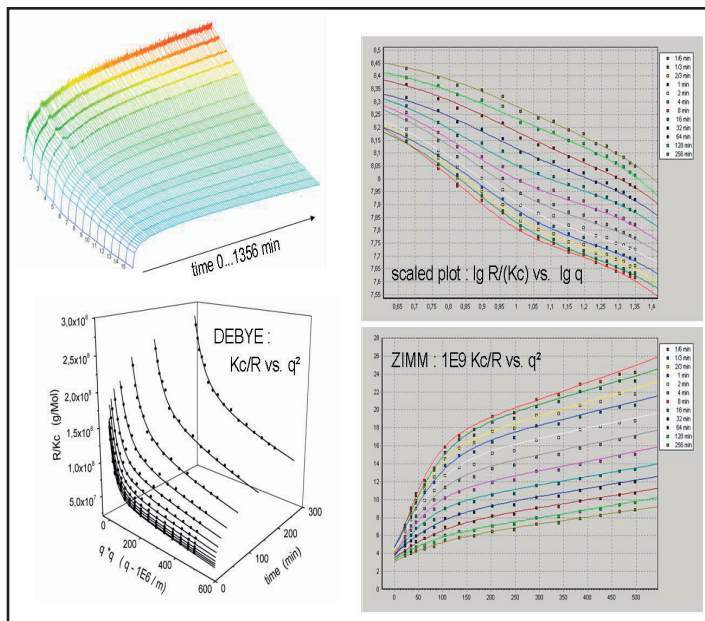
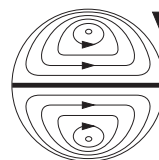


Figure 2. Different views of the data with higher concentrations of salt added (0.2N NaCl) fitting with bimodal systems.

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