

Latest innovations for colloid & interface characterization with Xenocs SAXS/WAXS instruments

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Colloids are omnipresent in everyone's life. From the lifetime of a paint pot on our garage shelf, in the formulation of drug carrier in spray or in solution up to the flocculating agents for water recycling, the interactions of nanoparticles with surfaces and interfaces are inducing a infinite variety of complex systems. Characterization of these systems is paving the road towards a better understanding of the final properties, together with their thermal stability, rheology etc.. One fundamental aspect of the colloidal science is that the matrix (usually a liquid), via electrostatic interactions and the ionic strength of the surrounding species has a major impact on the stability of the colloidal particles. As a reason, the capability to investigate the shape, size, interactions of particles in the presence of the matrix that is generally wet is of the utmost importance. Furthermore, the properties of a given dispersion are being largely determined by the interactions at the interface between the particle and the suspending medium. Colloid science and surface science are then closely interleaved.

Small angle and wide angle x-ray scattering is among few techniques that are able to characterize nanoparticles, colloids and suspensions within a liquid matrix. Small Angle X-ray Scattering (SAXS) is a powerful measuring method for investigating nanostructured materials, providing information in the range from 1 nm to beyond 150 nm such as nanoscale morphology, mesoscale phase identification or surface to volume ratio of internal structures as a few examples. The method requires little sample preparation, on solids or liquid form, is non-destructive and unlike microscopy probes a large volume of the sample enabling a statistically meaningful result. In addition, the same technique can be applied to surface only in the so-called "grazing incidence geometry". It can be combined with Wide Angle X-ray Scattering (WAXS) to get information on the material crystalline structure. Different experimental conditions such as temperature, humidity and mechanical fields (e.g. flow) can also be applied enabling in-situ structural investigation over changing conditions. Major developments in components and subassemblies have been achieved in the past few years. They are today integrated in the top-of-the-range SAXS/WAXS instruments, offering capabilities for fast routine measurements and enabling high quality data.

With more than 15 years of experience, Xenocs is a leading supplier of SAXS/WAXS/GISAXS laboratory systems. This presentation will summarize Xenocs latest developments on SAXS/WAXS/GISAXS instrumentation for colloids and surface characterization. The new Nano-inXider instrument combines all three techniques and integrates the latest technologies to provide the user with a high performance, easy-to-use and compact system for liquid systems. The Xeuss 2.0 system, the laboratory SAXS/WAXS equipment reference for many universities around the world, integrates new advanced features increasing furthermore its versatility. Not only it is today possible to measure simultaneously nanoscale features and crystalline structures during in-situ studies such as temperature controlled measurements, but this can be coupled with an increased sample to detector distance, enabling to extend the sample probe length to several hundreds of nanometers in the UltraSAXS regime.