Synchrotron Studies of Model Colloids: Pushing the Limits

Petukhov A.V., Dolbnya* I.P., Vroege G.J., Lekkerkerker H.N.W.

van 't Hoff laboratory for physical and colloid chemistry, Utrecht University, The Netherlands
*BM-26 DUBBLE, NWO/ESRF, Grenoble, France

Studies of the entropy-driven behaviour of suspensions of colloidal particles interacting via hard-wall potential yields insights into the nature of phase transitions and associated structural transformations, into the properties and dynamics of undercooled and supersaturated states, pathways and underlying mechanisms of crystallisation and melting. A significant progress has been recently achieved in real-space laser confocal microscopy of colloids. Scattering techniques can provide valuable complimentary information, which is unavailable on the basis of the real-space analysis only. Here x-rays have several important advantages often making them a unique tool allowing one to access necessary information. However, application of x-ray scattering to colloids is challenging since the x-ray wavelength is typically 3 to 4 orders of magnitude smaller than the size of the particles. Even more difficult is to address the positional correlations between these mesoscopic particles on distances much larger than their size.
In this contribution we shall discuss the possibilities to overcome existing limits in terms of the reciprocal-space resolution achievable at the ESRF. Several recent examples of applications of high-resolution small-angle x-ray scattering technique to various colloidal systems will be presented.