UNDERSTANDING DISPERSANTS IN PAINTS, PIGMENTS AND DYES

Dispersant agents are crucial to many diverse fields of application such as in paints, plastics, cosmetics and construction.

In general, dispersant agents improve the homogeneity of a system of particles by being absorbed on to particle surfaces and they assist in compatibilization of the surrounding medium and mediation of particle interactions. This helps improve colour strength and stability in paints and cosmetics, hardening and strength in construction as well as mechanical properties in plastics.

MEASURING DISPERSED PARTICLES

Evonik Industries produces many different systems that require the use of dispersants, but until now the actual mode of action is only poorly understood.

To help understand these systems, a series of measurements made possible via the Science Link project, were performed using Small Angle X-ray Scattering (SAXS) at the Coherence Beamline P10 at PETRA III at DESY in Hamburg. SAXS is sensitive to the size, structure, distribution, orientation and aggregation of particles in a solution and is a very useful technique for investigating Evonik's materials. Figure 1 shows typical results from the measurements, from which valuable information could be obtained on how dispersant molecules influence the interactions between dispersed particles.

LOW VS. HIGH CONCENTRATION

It was found that in low concentration, the dispersant only insufficiently covers the surface of the scattering particles and hence cannot completely screen attractive interactions between the particles. For high dispersant concentrations however, i.e. when a sufficient surface coverage of the particles by dispersant molecules is achieved, repulsive interactions between the scattering particles are induced – i.e. the system is sterically stabilized. This is shown schematically in Figure 2. It is hoped that this improved understanding of the mode of action of the dispersant molecules will lead to an optimization of Evonik's products.

Figure NUMBER ONE

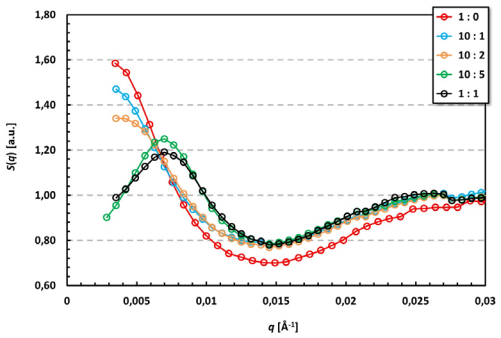
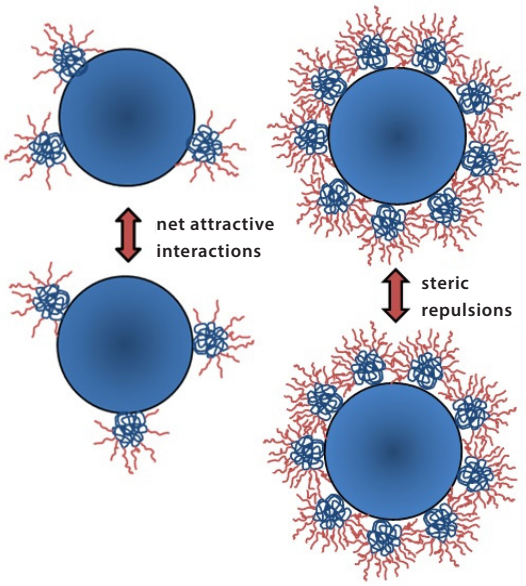


Figure 1 Interparticle structure factor S(q) of the system SiO_2 – Dispersant in solution for different SiO_2 to dispersant ratios. S(q) was extracted from the experimental scattering data recorded at DESY.

Figure NUMBER TWO



Science Link is a network between leading research facilities of photon and neutron sources and its users. The project aims to support and encourage innovation and entrepreneurship in the Baltic Sea Region. Apart from the research facilities, the network also includes scientific institutes, universities and regional organisations that serve as service and promoting units. Science Link is part-financed by the European Union (Baltic Sea Region Programme) and involves 17 partners from 8 countries during the project period 2012 to 2014.

For further information visit science-link.eu

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Research facilities

DESY
HZB Helmholtz Zentrum Berlin
Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research
MAX IV LABORATORY