COST D43: Colloid and Interface Chemistry for Nanotechnology

Program Workgroup 5: Active and Functional Interfaces

Target of the WG activities

A major scientific effort envisaged within this WG will be concentrated on a proper description of the surface-mediated organisation of nanoparticle systems (polyelectrolytes, colloids, mineral particles, proteins) into hierarchical structures of targeted architecture and functionality.

WG5 will collaborate extensively with WG1 in order to profit from the sensitive surface analysis techniques such as neutron and X-ray scattering, stagnation point reflectometery, AFM, confocal and fluorescence microscopy, and to design new efficient methods, e.g., streaming potential and streaming current measurements. An equally intense collaboration with WG2 is envisaged in respect to the synthesis of well-defined inorganic and organic colloid particles of various shape and morphology, for example metals (gold, silver), metal oxides and sulfides, latex particles, etc. Developing efficient methods of self-organisation of polyelectrolytes, block polymers and colloid particles leading to new soft materials will be the major issue of the collaboration with WG3. The collaboration with WG4 will be concentrated on studying attachment of microcapsules and carriers to various surfaces, adhesion strength determination and a controlled release of active substances from capsules.

Research Topics

1. General description of colloid, polymer and biocolloid transport to boundary surfaces. Convective transport, diffusion, external force, meniscus forces, electrophoretic deposition, role of electrostatic interactions in polar media and in air, adsorption and adhesion of particles to surfaces under hydrodynamic shearing forces.

2. Creating heterogeneous surfaces of targeted bioactivity and functionality. Precursor colloid, polyelectrolyte and molecular (thiol, silane) layers via self-assembling, colloidal and biocolloidal arrays, microcapsule attachment, nanoscale patterned surfaces, microcontact printing, imaging of features attached to surfaces (polyelectrolytes, biopolymers, DNA, proteins).

3. Multilayered, composite structures of controlled architecture. Multilayers of self-assembling colloid particles, polyelectrolyte multilayers at solid/liquid and solid/air interfaces, polyelectrolyte/protein/particle multilayers, gradient surfaces.

4. Application of nanostructured surfaces. Biosensors, adhesion surfaces, antifouling coatings, biocomatible coatings, artifical joints, microelectrophoretic and chromatographic supports, membranes, catalysts, semiconductive photocatalysts, optical narrow band filters, etc.

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Work-group composition.

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