

Editorial for a New Section: Colloidal Systems

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From a colloid science perspective, colloidal systems are not simply heterogeneous mixtures, but organized dispersed media in which solid particles, liquid droplets, gas bubbles, or other mesoscopic entities are distributed within a continuous phase. Owing to the small size of the dispersed units, 1 nm to 1000 nm, and the large specific interfacial area generated thereby, such systems exhibit properties that are markedly different from those of the corresponding bulk phases. Their behavior is governed by a complex interplay of interfacial phenomena, colloidal interactions, Brownian motion, hydrodynamics, and structural organization. For this reason, the study of colloidal systems constitutes one of the central parts of colloid and interface science and requires specifically developed experimental methods, theoretical approaches, and computational tools.

The concept of colloidal systems covers a wide range of materials, including dispersions, suspensions, emulsions, foams, sols, gels, and other structured soft matter systems. The significance of colloidal systems lies in the fact that their macroscopic properties are strongly linked to the size, shape, concentration, and surface characteristics of the dispersed entities, as well as to the physicochemical properties of the surrounding medium. The smaller the characteristic size of the dispersed entities, the larger the specific interfacial area, and therefore the stronger the effect of interfaces on the behavior of the whole system. By modifying these factors, one can tailor the stability, rheology, transport behavior, optical response, and overall functionality of colloidal systems. In this regard, low-molecular-weight surfactants, polymers, proteins, colloidal particles, and their mixtures play a decisive role, particularly in the design of structured systems such as emulsions and foams.

An understanding of the mechanisms of colloidal stability requires knowledge of surface forces and the behavior of thin liquid films separating the dispersed entities. Interactions between particles, droplets, and bubbles are governed by forces described in the classical DLVO theory, as well as by non-DLVO contributions like structural, steric, and hydration forces that become important at small separations. These forces, together with thin liquid film rheology and hydrodynamics, determine whether aggregation or coalescence occurs via barrier-controlled or barrierless pathways. Linking interfacial properties, surface forces, thin film stability and drainage behavior, and collision dynamics remains a challenging task. Contributions reporting theoretical, experimental, and instrumental advances in these aspects of colloidal systems are invited in this Section.

In many practically important situations, colloidal systems are formed, processed, transported, and utilized under dynamic non-equilibrium conditions. Their behavior may then be governed by droplet or particle deformation, aggregation, flocculation, coalescence,



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Ostwald ripening, drainage, creaming, sedimentation, jamming, and structural rearrangements under flow or external fields. The dynamic properties of colloidal systems can differ substantially from their equilibrium properties and may depend on composition, temperature, pH, ionic strength, rate of deformation, pressure, and confinement. Understanding these processes is essential not only for predicting stability and performance, but also for establishing reliable structure–property–function relationships in complex disperse systems.

Studies of colloidal systems therefore require multidisciplinary approaches, combining physics, chemistry, materials science, polymer science, soft matter science, chemical engineering, biology, mathematics, and computer modeling. At the same time, the knowledge obtained from such studies is of direct relevance to many practical fields. Colloidal systems play a key role in pharmaceuticals, food, cosmetics, coatings, detergents, biotechnology, energy-related materials, water treatment, environmental technologies, and many other industrial areas. Hence, this research field continuously benefits from a close interaction between fundamental investigations and application-oriented developments.

This Section aims to publish recent advances on all types of colloidal systems, including dispersions, emulsions, foams, suspensions, particle-stabilized systems, and other structured colloidal materials under both equilibrium and dynamic conditions. This also includes new methods for their preparation and characterization, as well as new theoretical, numerical, and modeling approaches for describing their formation, stability, dynamics, and functionality. While closely related to interfacial properties, self-assembling phenomena, multiphase flows, and applications, the Colloidal Systems Section is focused on the disperse material as an integrated system. Particular attention will be given to contributions clarifying the relationship between microstructure and macroscopic properties, and to studies promoting the rational design of colloidal systems for scientific and technological applications. All published papers should contribute to the further development of this specific area of science and stimulate new advances.

Conflicts of Interest: The authors declare no conflicts of interest.

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