

19th International Symposium on
SURFACTANTS IN SOLUTION

SIS 2012 CONFERENCE

University of Alberta, Edmonton

Program and Abstracts

June 24 - 28, 2012

Edmonton, Alberta, Canada

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Salt-free catanionic surfactants in water: role of chain-length mismatch on multifaceted aggregation behavior ,

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Swelling bilayer-forming amphiphiles are relevant materials *inter alia* for the building of biomimetic membrane systems and the formulation of microemulsions, multilayered films, nanoreactors and molecular transporters. If these molecules also show some type of stimuli-responsive aggregation, further practical relevance is added, e.g. in the rheological control of colloidal materials. Salt-free catanionic surfactants, or ion-paired amphiphiles, are complex salts of the $C_m + C_n$ - type, where the two amphiphilic ions of opposite charge act as counterions to each other [1-3]. They are a versatile class of swelling compounds, with their self-assembly being easily tunable by the choice of molecular structure, and variables such as temperature and ionic strength. In this talk, we will address recent investigations on the aqueous phase behavior and microstructure of a series of salt-free catanionics with varying chain length mismatch, $m \neq n$ [3-5]. Compared to the more general catanionic mixtures ($C_m + X^- / C_n + Y^+ / \text{water}$ systems), these compounds have neither inorganic salt present nor excess of ionic amphiphile. Thus, any surface charge density (σ) on the catanionic film will arise solely from differences in the individual solubilities of the two ions, leading to long screening lengths and modulations of spontaneous curvature [3].

This solubility mismatch results in some peculiar features of aggregation, including the coexistence of lamellar phases, intermediate phase formation, temperature-dependent vesicle-to-micelle transitions, fusion and fission of bilayers and (in ternary systems) to microemulsion formation [3-5]. For instance, on the dilute region of the binary phase diagrams, spontaneous formation of vesicles is observed for most of the systems, and interestingly many of these vesicles undergo a (reversible) transition to elongated micelles with temperature, via a bilayer fusion-fission mechanism.

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Fixing of gathering dust surface of the Aral Sea by interpolymer complexes of polyethylenimine ,

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Now it is known, that the extensive areas of naked sea-bottom of Aral are covered by adjournment of the marine salt mixed with mineral fertilizers and other toxic compounds. Carried away by wind and water, this poisonous dust is transferred on hundreds kilometers. Inhalation of a poisonous dust undermines health of the person, reduces of immunity, leads to allergic and many other diseases.

Desiccation of the Aral Sea has also lead to some change of a local climate. During the past years the Aral climate has been changed from Continental. At that moment the measures undertaken by the scientists and different organizations to improve of ecological condition of the Aral region are not able to stop

global ecological accidents. Therefore the urgency of research and elimination of the problem do not cause doubts. From our points of view, carrying out complex researches including structurization of soil by fixing of its superficial layer to prevent the land from erosion process and to improve of ecological condition such as reduction of negative influence on ∞ ero- and hydrosphere of eroded soil is needed.

The main goal of the present work to determinate regularities of structurization of eroded soils of Aral Sea by polyethylenimine and its composition with sodium humate. The concept about soil as about disperse system with complex microheterogeneous structure allows to apply regularities of physical and chemical mechanics to processes of structurization of soil dispersions. In the given work the wind erosion is simulated as a set of the interconnected processes of separation, carrying and depositing of soil particles by wind. Previously we investigated the optical density, viscosity, electrokinetic potential and the plastic strength of soil suspension. Such correlation of physical and chemical parameters has allowed to use the given polymers and their interpolymer complexes (IPC) to increase antierosion stability of mineral dispersion.

The detected phenomena at studying of soil suspensions plastic strength have proved to use of IPC data for increasing of antierosion stability of soil suspension upon wind erosion. Growth of concentration and molar ratios of reagents leads to decreasing of deflation of soil particles. Intensity of polymers and IPC deflation is nearly 5-6 and 2-3 % respectively that testifies about formation of durable soil units.

Investigation of influence of IPC deposition method on soil surface has shown an insignificant difference in fixing of superficial layer. Amount of fixing at spraying of prepared IPC is 91,4-92,6%. Amount of fixing at consecutive deposition is 92,29-92,78% and is 92,31-92,77% at consecutive fixing. The difference in fixing of soil superficial layer is 1,4%.

It is established that the fixing of soil dispersion by IPC has been proceeded by the formation of associates stabilized by Coulomb and hydrophobic interactions, van der Waals forces, as well as coordination and hydrogen bonds. Fixing effect of IPC is reduced to electrostatic interactions with the soil surface, penetration into the interior of a polydisperse system and binding the soil colloids by hydrophobic interactions and hydrogen bonds. As a result the strong soil structure, which has good anti-erosion properties, has been formed.

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Molecular behavior of lubricants/additives under lubricating condition ,

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Fourier Transform Infrared Spectroscopy (FT-IR) equipped with pin-on-disk tribometer, which realizes the simultaneous measurement of friction force, normal load, and IR spectrum, was used for analyzing molecular behavior of lubricants/additives under lubricating condition, and sum frequency generation (SFG) spectroscopy was used to obtain static information on the molecular structure of the boundary layer. Self-assembled monolayers (SAMs) of hexadecanethiol (HDT) and 16-mercaptohexadecanoic acid (MHDA) were used to vary the surface chemical properties, and oleic acid (OA) was used as a lubricant in order to clarify the effect of surface chemical properties on the frictional property. In addition, we used 1-methyl-3-butylimidazolium trifluoromethanesulfonate ([BMIM]OTf) and 1-methyl-3-butylimidazolium tetrafluorophosphate ([BMIM]PF₆) as lubricants in order to evaluate the influence of water on the tribochemical reaction of room-temperature ionic liquids (RTILs). From the SFG and FT-IR results, the relationship between surface chemical properties and chemical properties of lubricants is considered to