

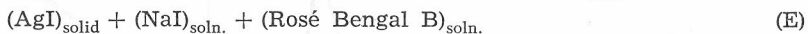
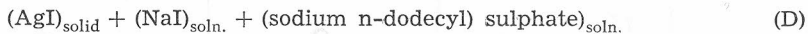
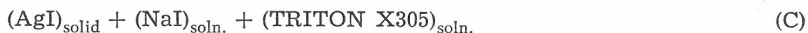
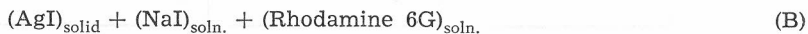
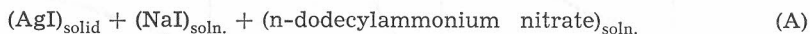
On »Silver Iodide + Surfactant« Systems

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The effects of three different groups of surfactants are discussed: the ionic nonconstituent, the ionic constituent and the nonionic nonconstituent surfactants. On the basis of graphs: electrophoretic mobility *vs.* concn., turbidity *vs.* concn. and fraction of exchange *vs.* log of exchange time, four different types of systems can be distinguished.

Silver iodide sols prepared »*in statu nascendi*« and aged in aqueous media in the presence of various surfactants show a dependence of the colloid properties of the systems on the chemical nature and concentration of the surfactant present. The very strong effects at low concentrations of surfactants on the colloid behaviour of an inorganic suspension are well-known; (i) the dependence of electrophoretic mobility $w_{+,0,-}$ ($\text{cm}^2\text{V}^{-1}\text{s}^{-1}$) upon concentration c ($\log c_M T^{+,0,-}$) of both cationic nonconstituent T_n^+ and constituent T_k^+ , nonionic T^0 and anionic T^- surfactants; (ii) the dependence of turbidity τ upon the concentration of surfactants, and (iii) the course of radionuclide fixation process, measured as the fraction of exchange F -values versus exchange time t_A , of various types and at various surfactant concentrations, were investigated. The following »silver iodide + surfactant« systems were examined:



Three different groups of surfactants will be considered¹ on the basis of experimental data:

(I) Ionic nonconstituent surfactants T_n^+ and T_n^- .

Nonconstituent surfactants can exist in cationic T_n^+ and anionic T_n^- forms as different species. T_n^+ and T_n^- cannot build a chemical compound with the solid phase present. T_n^+ can flocculate the negative AgI sols at low T_n^+ concentration and deflocculate again at a higher concentration, causing the reversal of charge and overcharging of the sol particles (measured as electrophoretic mobility $w_{+,0,-}$). T_n^+ changes turbidity τ of negative silver iodide sols showing twinned maxima, one of which corresponds to the electrostatic interactions

between silver iodide particles and T_n^+ , and the other corresponding to the formation of »silver iodide with T_n^+ bound at the crystallite surface + surfactant« systems². At higher T_n^+ deflocculation concentrations (full line, Figure-A) the rate of fixation is increased. For instance: (A) type systems.

T_n^- can destabilize the negative silver iodide sols at low concentrations, causing a change in turbidity τ of the negative AgI sols; T_n^- causes certain

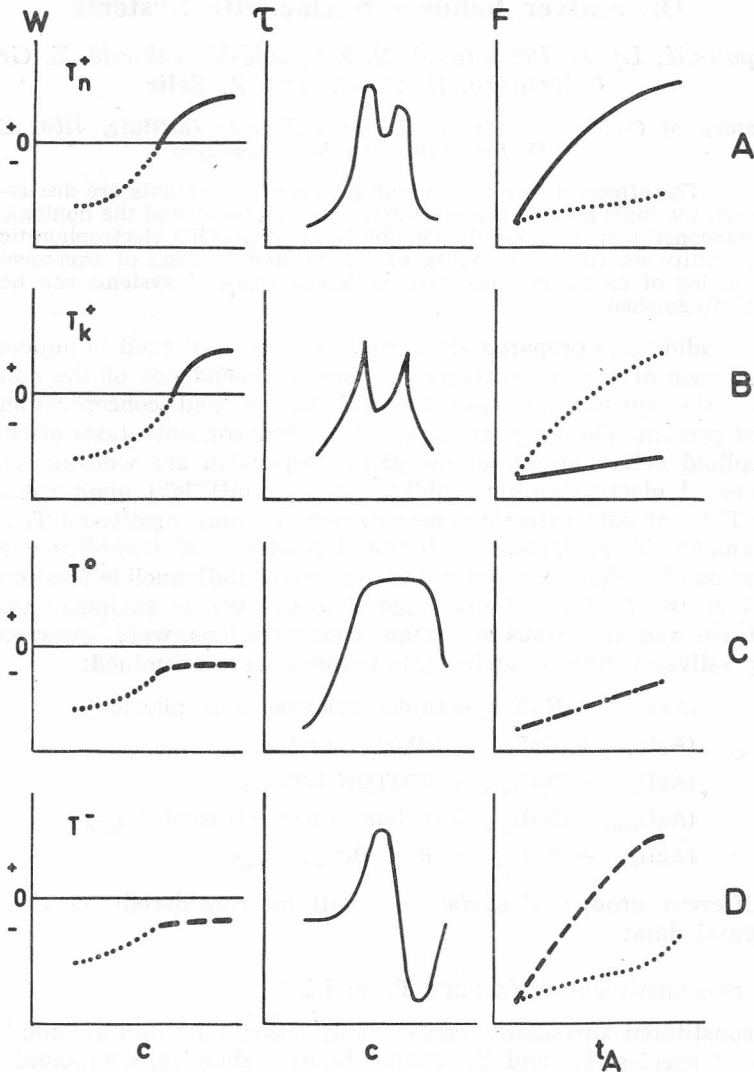


Figure. Systems: Negative silver iodide sols prepared *in statu nascendi* in the presence of various types of surfactants T (see text). Electrophoretic mobility, w ($\text{cm}^2\text{V}^{-1}\text{s}^{-1}$), and turbidity τ are plotted against the logarithm of concentration c of the surfactant present (schematic curves). Fraction exchange F is plotted against the log of exchange time t_A (schematic curves). In all cases the dotted part of curves correspond to the negative silver iodide particles; the full line corresponds to the overcharged and the dashed part of the curves to the silver iodide particles with diminished electrophoretic mobility.

quantitative variations of electrophoretic mobility and at higher concentrations (dashed line, Figure-D) causes an increase in the rate of fixation³. For instance: (D) type systems.

(II) Ionic constituent surfactants T_k^+ and T_k^- .

They can exist in cationic T_k^+ and anionic T_k^- forms as different dyes. These dyes can build chemical compounds with the particles of the precipitate. At higher dye concentrations⁴ they surround the AgI particles because of induction crystallization. At low concentrations of T_k^+ the particles of sols will be stabilized or overcharged full line, Figure-B). At higher T_k^+ concentrations the rate of fixation is decreased⁴. Turbidity measured as a function of T_k^+ concentration c (log scale) shows two very sharp maxima indicating the formation of a complex system similar to that in the (A) type system, but with the dye crystallites oriented very closely towards the silver iodide crystal plane. For instance: (B) type systems. T_k^- can build a chemical compound with the cation in the silver iodide crystal lattice; for instance: (E) type systems. The result is a complex system »silver iodide with T_k^- bound to the crystallite surface + precipitated compound between silver and $T_k^- + T_k^+$ excluded from solution«⁵.

(III) Nonionic nonconstituent surfactant T^0 .

The molecules of T^0 cannot build chemical compounds with particles of the solid phase present, and cannot markedly change the charge of particles, although at different concentrations they still cause destabilization at low concentrations of T^0 (dotted line, Figure-C) and stabilization at high concentration of T^0 (Figure-C dashed line). The rate of fixation measured as fraction exchange F vs T^0 concentration c is independent from T^0 concentration⁶ (Figure-B, dotted and dashed line, F vs. t_A). A comparison of the data presented indicates the formation of complex colloid »silver iodide + surfactant« systems characterized by properties depend on the nature of the surfactant and its concentration. Results presented schematically show that the various types of surfactant cause different and often opposite effects in the same inorganic sol.

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SAŽETAK**O sistemima »srebrni jodid + tenzid«**

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Negativni solovi srebrnog jodida pripremani »*in statu nascendi*« u prisustvu tenzida, pokazuju ovisnost koloidnih svojstava o kemijskoj prirodi i koncentraciji prisutnog tenzida. Na temelju razmatranja elektroforetske gibljivosti, mutnoće solova i brzine uspostavljanja heterogene ravnoteže između jodidnog iona u tekućoj i čvrstoj fazi, može se prema kemijskoj prirodi i djelovanju tenzide svrstati u tri grupe (ionski nekonstitutivni; ionski konstitutivni i neionski tenzidi). Analiza rezultata pokazuje, da postoji pet različitih oblika međudjelovanja između srebrnog jodida i tenzida koji određuju koloidna svojstva sistema »srebrni jodid + tenzid«.

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