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THE MECHANISMS OF FLOCCULATION PROCESSES BY CATIONIC POLYELECTROLYTES IN THE PRESENCE OF NATURAL ORGANIC POLYMERS

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The colloidal suspensions found in natural waters contain clay minerals together with naturally occurring organic matter, mainly fulvic and humic acids. Both fulvic and humic acids are formed from vegetable matter through bacteriological activity. They are high molecular weight natural polymers and their constituents are mostly aromatic anionic carboxylate and hydroxylate groups. However, fulvic acids are more soluble in water and are somewhat different from humic acids. Their molecules consist of less carbon atoms, and more oxygen and nitrogen, and contain more hydrolyzable functional groups and less aromatics. Fulvic acids also contain carbohydrates, aminosacharides, phenolic and nitrogeneous compounds. Investigation of the flocculation processes in fulvic and humic acids- montmorillonite clay suspensions, at various degrees of interactions, showed that these systems behave differently from pure clay mineral suspensions.

The mechanisms of flocculation processes were studied in controlled systems of fulvic and humic acids solutions alone, and in the presence of clay mineral and organo-clay complex suspensions. The mechanism was

studied by using a radioactively labelled cationic polyelectrolyte.

The salts of humic and fulvic acids, which are anionic polyelectrolytes, react chemically with the polycationic flocculant through carboxylate and phenolate groups, forming colloidal-reaction-product, which first appears as an increased turbidity, and can be removed by settling.

The presence of fulvic and humic acids in solution, or as a complex on the mineral clay particles, inhibits the process of flocculation, due to their chemical reaction with the cationic flocculants.

There is a competition on the reaction with the cationic polyelectrolyte between the natural organic anionic polymers, free in solution or adsorbed on the organo-clay complex, and the mineral colloidal particles. The natural organic polymers react first, and only after the reaction of their neutralization by the cationic polyelectrolyte has been completed, the flocculation of the mineral colloidal particles will occur, and good clarification of the treated water can be achieved.

In all systems studied, the residual flocculant concentration of dosage levels giving good flocculation and clarification was extremely low. This fact is very important from a public-health point of view.