Biological solids of the sewage-purification facilities

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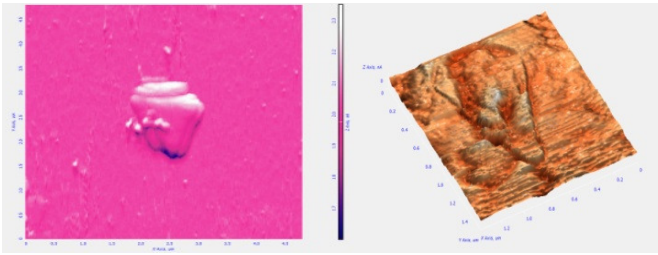
One of the main ecological problems of the 21th century is a protection of the water systems from pollution by products of human life. Biological sludge is a safety substance, its active microorganisms provides continuous aeration and clean the sewage up to almost clean water.
Activated sludge is represented by living organism and solid substratum. Vital functions of it are based on ability of microorganism to use the contaminant as alimentation in certain conditions (temperature, treatment, pH and redox reactions). The population of activated sludge serves to the estimation of operating practices of treatment facilities in every phase of the sewage purification.
Metabolism continuously processing in the cell with complex of chemical and physical reactions provides the growth and activity. Metabolic process occurs at anabolic reactions (reducing) by biosynthesis from single molecules to complex with energy consumption and catabolic reaction (oxidative) when complex compound break up to single molecules with energy liberation. As energy source the cell uses the adenosine triphosphate. Process of oxidation is $C_xH_yO_z + O_2 \rightarrow CO_2+H_2O - \Delta G_0^0$. Oxygen does not directly take a part in the contamination acescence but it is necessary for microorganisms breathing and to obtain energy for maintenance of biosynthesis. So, for example, we can calculate the value for palmitic acid $CH_3(CH)_214COOH$, which is in the composition of yeasts: $C_{16}H_{32}O_2 +23O_2 \rightarrow 16CO_2+16H_2O$ – 2338 kcal. Microorganisms use the oxygen in the dissolved condition at continuous aeration of the ambient. During the anaerobic process microorganisms use for oxydation of organic or inorganic matter not molecular oxygen but oxidized compositions as sulfuric and carbonic acids, and nitrites. And the reactions are $2HNO_3+12H \rightarrow N_2+6H_2O+2H$ and $H_2SO_4+8H \rightarrow H_2S+4H_2O$.
Scanning probe microscopy allows carrying out the quantitative analysis of morphological and mechanical properties of microorganisms (Fig.1) and shows the character of their distribution in dependence on seasonal abundance and processing techniques. Although the images not excessively sharp, it allows the common morphology to be distinguished.



(a) (b)

Fig 1. Vorticella convallaria in contact error (a) and force modulation mode (b)

The obtained data have both practical importance for understanding of cleaning units, and theoretical value for the descriptive biology. The data allow carry out the qualitative analysis of structural and mechanical properties of the protozoa.