UNITED RESEARCH FORUM
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4th International Congress on Earth and Geological Sciences

July 21-22, 2025 | Paris, France

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Biofilms as indicators of biogeochemical processes in groundwater

Groundwater is a vital keystone ecosystem of the global water cycle, occurring unique biogeochemical processes and providing essential services to societies. Groundwater treatment capabilities are constantly being improved and include the use of integrated approaches and the development of new technologies depending on regional specifics. The main characteristics of groundwater in the Far East of Russia is the high content of dissolved iron (from 10–20 to 30–50 mg/L) and manganese compounds (1–8 mg/L) and high humification. The "Subterra" technology was applied for precipitation of iron and manganese in aquifer through the formation of biogeochemical barriers with the participation of various physiological groups of microorganisms at injection of oxygen-bearing water in the wells. Disruption of the sustainable natural processes of groundwater microbiome functioning resulted in the onset of biofouling and the formation of biofilms in the near-well space, in wells and in the water treatment system. The aim of the study is to determine the main factors contributing to the development of biofilms in the underground hydrosphere during defferization and demanganation in aquifer. Biofilms and water samples were studied with cultural and molecular methods (RG-6000-5 Plex real-time DNA cycler, Qiagen, Germany), light (Imager-A2, Carl Zeiss, Germany) and scanning electron microscopy (EVO-40HV, Carl Zeiss, Germany). It has been established that biogeochemical processes in groundwater determine the capabilities and adaptation mechanisms of nature microbial complexes and can change the growth strategy of microorganisms under the influence of natural and anthropogenic factors. Different physico-chemical parameters can stimulate biofilm formation. It can be the main reason of negative consequences associated with the risk of deteriorating the water quality and technical characteristics of water intake equipment.

Keywords: biofilms, biogeochemical processes, groundwater, water treatment, colmatage

Biography

Litvinenko Zoia, 20.11.1988, was born in Khabarovsk, Far East, Russia.

Higher education: Far Eastern State Transport University, Engineer of life safety; Pacific National University, Master of Pedagogical, biological sciences. Ph.D of Biology, 2015, Dissertation topic – Influence of organic substances on biofilm formation in water systems, 2015.

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Scientific interests: biofilms, biogeochemistry, microbiology of nature ecosystems, water treatment, groundwater, organic substances.

ISBN: 978-1-917892-13-1

doi.org/10.51219/URForum.2025.Litvinenko-Zoia