Evolution of biogeochemical precipitation at discharging thermal water – Experimental study 2

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ABSTRACT
Biofilms exist in many thermal spring caves and even in thermal water wells of the Buda Thermal Karst, Hungary. Chemolithoautotrophic bacteria form these biofilms as no light penetrates into the spring caves. The biofilms have low TOC content, their inorganic part mainly consists of calcium, silicon, iron and magnesium. The main iron-bearing phases are ferryhidrite and goethite providing for the red color and the adsorption capacity of the biofilm. Trace elements like radium, tin, lead, zinc, arsenic, titanium etc. are usually adsorbed by the biofilm with high enrichment factors compared to the water they exist in. Though many properties are known about the existing biofilms, their evolution and their interaction with the water is less studied.
The aim of our research was to study the formation and evolution of precipitates by a 12 week-long in situ experiment in the tunnel of Gellért Hill, Buda Thermal Karst, Hungary. During the experiment the precipitates and the water were monitored in time and along the flow path (a 120 m long canal) of the thermal spring in a controlled environment. Temperature, pH, specific electric conductivity and dissolved oxygen content were monitored continuously at the beginning and at the end of the studied section of the canal. Other parameters (redox potential, concentration of major ions, dissolved carbon dioxide content, concentration of radium-226, uranium-234+238 and radon-222, TOC and TN content, concentration of trace elements) were measured three times during the experiment (0, 6th, and 12th week). The evolved precipitates were sampled twice (6th, 12th week) and were analyzed by XRD, SEM, ICP-MS, Mössbauer spectroscopy and gamma spectroscopy. The controlled environment helps to interpret the results and the influencing factors regarding the evolution of the precipitates.
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