Abstract

This thesis is focused on the diversity of microorganisms of prokaryotic type living in the environments, where microbial sulfidic mineral precipitation or decomposition occur. The relationship between the microbial community composition and geochemical processes was examined. To the best of our knowledge, we were the first to analyze microbial communities from gossan and their significance for the ecosystem of a large sulfidic ore deposit. In addition, we compared the microbial assemblies at multiple habitats associated with generation or transformation of acidic mine drainage (AMD) and described niche partitioning among closely related organisms. The unexpectedly variable communities in stalactites growing on the AMD springs were utilized as a model for assessing neutral variability of the microbial communities. They clustered almost randomly even though the environmental conditions corresponded with the localities. This is an important difference of the simple communities from stalactites and the common highly diversified microbial assemblies. The communities found in sediments, soil, and many other complex substrates usually reveal high correlation with their environment. We propose that neutral fluctuations of the community composition are suppressed by averaging multiple physically separated microcommunities in each highly-diversified microbial community. In agreement with this assumption, the clustering of the stalactite communities by locality was enhanced by pooling few communities from a single site together. The microbial communities precipitating realgar (As_4S_4) in the shallow saturated sediment were examined in the second part of the study. Various and contrasting microhabitats were revealed in the sediment. It is probable that opposing processes, for example autotrophic arsenite oxidation and dissimilative arsenate reduction, take place in close vicinity. Such a patchy structure of the sediment suggests that the highly localized intensive sulfate reduction is essential for the realgar formation.