The rate of thiocyanate degradation in natural aquatic and sediment systems

IRINA KURASHOV[1], ALEXEY KAMYSHNY[1]

[1] Ben-Gurion University of the Negev, P.O.B. 653, Beer-Sheva, 84105 Israel (*correspondence: beatrisa69@gmail.com)

We have studied the degradation rates of SCN^- under broad range of conditions relevant to natural aquatic systems. The rates of thiocyanate decomposition were measured in waters and sediments of marine and limnic systems under various redox conditions (oxic, ferruginous, sulfidic). Incubation experiments on degradation of thiocyanate in sterilized and non-sterilized water samples from Mediterranean Sea, Lake Kinneret, and Milli-Q; as well as in sediment samples from the Red Sea and Lake Kinneret were performed during up to 164-day period. The initial concentrations of SCN^- were 3-3000 $\mu mol \cdot L^{-1}$.

Thiocyanate decomposition rates in natural aquatic systems were found to be controlled by microbial processes under both oxic and anoxic conditions. The Michaelis-Menten model was applied to estimate kinetic parameters of thiocyanate decomposition, and half-life times in natural water systems. Lag times for thiocyanate increased from ≤2 hours in oxic sediment samples to 64 days in marine water samples in the presence of iron(II). Half-lives of thiocyanate varied from ≤12 hours in oxic sediments to 391 days in ferruginous limnic water (at 3 $\mu mol \cdot L^{-1}$ of SCN^- concentration).

It was found that in sediments decomposition of thiocyanate is faster than in the water column. Under oxic conditions thiocyanate degradation is faster than under anoxic conditions. In the presence of hydrogen sulfide the rate of thiocyanate decomposition increases under anoxic conditions (except for the Mediterranean water samples where this effect was not observed), whereas the presence of iron(II) decreases of thiocyanate decomposition rate.