Methanogenic growth at extremely low H_2 if Ni is available.

NEUBECK A[1]., SCHNÜRER A.[2]

[1]Dept. Geol. Sci., Stockholm University, Sweden
[2]Dept.Microbiol., Swedish University of Agricultural Sciences, Sweden

Limitation (<8ppb) as well as excess (>150ppb) of available Ni reduces the methanogenic capacity to consume H_2. We have compared the growth of three different methanogenic species in growth medium where Ni is either depleted or in excess. The H_2 threshold in an optimal growth medium was two orders of magnitude lower (0.7 pH_2) than in the medium with Ni limitation or excess (35 pH_2). No significant differences in CH_4 production could be detected. This implies that Ni stress limits the methanogenic ability to grow in environments with low H_2 concentrations. In terms of survival of microorganisms in the deep subsurface, a very low pH_2 would be expected due to the slow alteration rates of H_2 producing minerals at the low temperatures needed to sustain microbial growth. Our study shows that Ni is essential for keeping the pH_2 low, indicating that any natural H_2 driven systems has to either supply high Ni concentrations and/or high H_2 concentrations in order to sustain a methanogenic culture. A deep subsurface environment where the Ni is relatively high would allow methanogenic cultures to sustain even with slow releases of H_2 from water-rock interactions.