Biogeosciences Discuss., 8, C318–C320, 2011
www.biogeosciences-discuss.net/8/C318/2011/

Biogeosciences Discussions

Interactive comment on "Experimental fossilisation of viruses from extremophilic Archaea" *by* F. Orange et al.

F. Orange et al.

francois.orange@cnrs-orleans.fr

Received and published: 21 March 2011

Thank you very much for your comments on our manuscript.

This study is indeed preliminary and the objectives were limited to obtaining a preliminary insight into the fossilisation of viruses of extremophilic Archaea and a qualitative monitoring of the processes that occur during fossilisation. The fact that the organisms were fossilised within the media used to collect and store them meant that the viral particles could be preserved for a longer period of time and thus allow eventual fixation of the silica to their surfaces. The exact influence of the media used is not precisely known.

We assumed (but could not verify, for the reasons mentioned thereafter) that the silica

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

behaviour during these experiment was similar to that described in previous experimental fossilisation experiments (review in Konhauser et al. 2004) : upon injection into the vials, silica was in a monomeric (Si(OH)4) or slightly polymeric form and quickly polymerized as a colloidal amorphous silica precipitate. Dissolved silica (at a concentration close to the saturation concentration, i.e. 61.7 ppm Si (132 ppm SiO2) at 20°C, Gunnarsson & Arnórsson 2000) must have remained in the medium after this initial polymerisation. In support of this, the silica precipitate formed in the SIRV2 and PAV1 experiments was similar to that observed in previous fossilisation experiments (Orange et al. 2009). The different aspect of the silica precipitate formed in the PAV1 experiment (Fig. 4c) was probably due to the influence of the medium (which includes EDTA). This could be possibly partly responsible for the different fossilisation patterns (cf. Cs detected together with Si).

The small volumes involved in the experiments (for the SIRV2 experiment : 20 μL ; for the TPV1 fossilisation experiment) did not allowed precise measurement of the pH and silica concentration evolution over time, and also led to an error margin in the silica concentrations. The media in which the virus were kept were at pH 6 (SIRV2) and pH 8 (PAV1 and TPV1). We assumed that the injection of the silica solution at pH 8 only slightly increased the pH in the SIRV2 case, while it did not change the latter case.

We were actually not aware of the researches and articles by Kyle and Daughney, which we acknowledge to be relevant to our experiments and results. Thank you very much for indicating them to us.

This information in answer to the comments made will be added or more clearly presented in a future revision of the article.

Answers to minor comments :

- The composition of the media was as follows :

SIRV2 experiment : Tris-acetate buffer (20 mM Tris-acetate, pH 6)

BGD

8, C318–C320, 2011

TPV1 experiment : TPV1-buffer (10mM Tris-HCl, 100mM NaCl, 5mM CaCl2, pH 8)

PAV1experiment : TE buffer (10mM Tris-HCl and 1mM EDTA, pH 8)

- PEG 6000 = Polyethylene glycol. 6000 = average molecular mass (g/mol)

References

Gunnarsson, I., and Arnórsson, S.:Amorphous silica solubility and the thermodynamic properties of H4SiO°4 in the range of 0° to 350 °C at Psat, Geochim. Cosmochim. Ac. 64, 2295–2307, doi:10.1016/S0016-7037(99)00426-3, 2000.

Konhauser, K. O., Jones, B., Phoenix, V. R., Ferris, G., and Renaut, R. W.: The microbial role in hot spring silicification, Ambio, 33, 552–558, 2004.

Orange, F., Westall, F., Disnar, J. R., Prieur, D., Bienvenu, N., Le Romancer, M., and Défarge, C.: Experimental silicification of the extremophilic Archaea Pyrococcus abyssi and Methanocaldococcus jannaschii, Applications in the search for evidence of life in early Earth and extraterrestrial rocks, Geobiology, 7, 403–418, doi:10.1111/j.1472-669.2009.00212.x, 2009.

Interactive comment on Biogeosciences Discuss., 8, 2235, 2011.