

## ***Analysis of Ancient Austrian Rock Salt by using Electron-microscopic techniques.***

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*For understanding how microorganisms are able to survive long periods of time embedded within sediments it is essential to investigate the fine structures and the average chemical composition of the minerals where they were isolated from.*

Subsurface salt mines, like those in Bad Ischl and Altaussee (Austria), are examples of sites where extremely halophilic microorganisms can be found. Some of the most recent isolates from ancient Austrian salt mines are *Halococcus dombrowskii*<sup>(1)</sup> from Bad Ischl and *Halobacterium noricense*<sup>(2)</sup> from the salt mine near Altaussee. Due to tectonic shifts during the formation of the Alps the salt deposits were exposed to varying pressures and temperatures. Therefore the surface morphology of Alpine minerals is very heterogenic.

In this study a JEOL 8200 Electron Microprobe and a JEOL 5800LV SEM equipped with an Oxford Analytical ultrathin-window EDS and an Oxford Isis 300 X-ray analyzer were used to analyze the ultrastructure and chemical composition of 250 million year old rock salt from the salt mine in Altaussee. The detected mineral structures, which occur at grain boundaries and in fluid inclusions, were examined for their significance as possible microbial habitats.

In addition, cells of *Halococcus dombrowskii* and *Halobacterium salinarum* NRC-1 were embedded within salt crystals under laboratory conditions and subsequently analyzed by electron microscopy. The modifications in cell structure and chemical composition were also analyzed using transmission electron-microscopic techniques and electron energy loss spectroscopy.

*The morphological and chemical data should provide new insights into the strategies how extremely halophilic archaea are able to stay alive in an ecosystem that lacks oxygen, light and nutrients. Such an extreme environment is therefore an interesting study object to explore life on earth and in the outer space.*

### *References:*

- 1 Stan-Lotter H., Pfaffenhuemer M., Legat A., Busse H. -J., Radax C. & Gruber C. (2002). *Halococcus dombrowskii* sp. nov., an Archaeal Isolate from a Permo-Triassic Alpine Salt. *Deposit. Int J of Syst Evol Microbiol.* 52, 1807-1814.

2 Gruber C., Legat A., Pfaffenhuemer M., Radax C., Weidler G., Busse H.-J. and Stan-Lotter H. (2004) *Halobacterium noricense* sp. nov., an archaeal isolate from a bore core of an alpine Permian salt deposit, classification of *Halobacterium* sp. NRC-1 as a strain of *H. salinarum* and emended description of *H. salinarum*. Extremophiles. (in press)