Physikalisches Kolloquium

Institut für Optik und Atomare Physik

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Laboratory simulations: the key for finding evidence of extra-terrestrial life

The question of whether Earth is a unique location for life in the Solar System remains one of the most enduring questions of our time. Increasingly, data suggests that other habitable environments may exist. One of the main tasks is to investigate whether life could exist in these potentially habitable environments, and if so, what evidence could be used to determine, or negate, the presence of life.

The presence of water is central to when, where, and under what conditions, past or present life may have existed in the Solar System. However, life is not solely dependent on water; the chemical elements carbon, nitrogen, hydrogen, oxygen, phosphorus and sulfur, and an energy source, are also essential. With increased knowledge about the occurrence of these environmental conditions on other Solar System bodies, such as Mars and the icy moons Europa and Enceladus, claims have been made that these environments could potentially be habitable. However, it is unclear if the associated physical and chemical parameters within these potentially habitable environments could indeed support life. If life did exist, how would the geochemistry within these environments differ from similar environments without life? Would different types or abundances of secondary alteration minerals form and could they therefore be used as bio-signatures?

Here, I will discuss the simulation facilities that have been developed at The Open University to study habitability within sub-surface environments. I will also discuss a novel approach that we are using, which combined laboratory-based biotic experiments with thermochemical modelling to identify secondary alternation minerals that could be used as potential bio- signatures for life.

Thursday, 13.06.19 · 16:15h · EW 202

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