Surface site specific attachment of microbes in the context of calcite dissolution

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Carbonates have been widely used as model systems to study the dissolution and growth of crystals due to their important role in numerous biogeochemical cycles and particularly in the sequestration of carbon dioxide. While the enhancing influence of microbes on the degradation of carbonate minerals has been described for decades, inhibitory effects on the calcite dissolution have been observed in recent years. The attachment of microbes to specific crystal surface sites, i.e., etch pits, has been emphasized as one key aspect in the microbial interference with the calcite dissolution process [1]. However, a more quantitative understanding of the interaction between microbes and crystal surface topography is needed to provide any predictability of the dissolution and precipitation kinetics in the presence of microbes.

Here we apply vertical scanning interferometry to quantify and compare the interactions between the environmental microbe *Shewanella oneidensis* MR-1 and calcite surface sites having differing surface energy such as terrace sites, steps and etch pits. We discuss results about preferred bacterial attachment and the resulting impact on the calcite dissolution kinetics and apply the concept of rate spectra [2] in order to identify the microbial impact on the overall reaction rate.

[1] A. Luttge, P.G. Conrad (2003), *Appl Env Microbiol*, **70**, 1627-1632. [2] Fischer et al (2014), *Appl Geoch* **43**, 132-157.