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Biogeosciences Discussions

Interactive comment on "In vitro formation of Ca-oxalates and the mineral glushinskite by fungal interaction with carbonate substrates and seawater" *by* K. Kolo and Ph. Claeys

Anonymous Referee #1

Received and published: 1 June 2005

GENERAL COMMENTS This is a well-written paper that provides detailed documentation of processes and products associated with interactions between fungi and substrates of dolomite and seawater. Results of this study have broad implications, from recognizing the presence of primitive life forms on ancient exposed substrates on Earth and other planets, to the preservation of historic buildings, statues, and other works of art. Moreover, fungal-rock interactions like those documented by the authors may contribute significantly to the global cycles of Ca, Mg, and C. Although the restriction of fungal-rock interactions to rock surfaces suggests that the processes do not contribute significantly to the diagenesis of thick sequences of sedimentary strata in the rock record, the presence of the minerals (and/or their pseudomorphs) described herein may aid in the diagnosis of ancient subaerial exposure surfaces. For these reasons, I

believe this paper will be of broad appeal and is appropriate for Biogeosciences Discussions.

SPECIFIC COMMENTS My comments stem primarily from my background in carbonate geochemistry and petrography.

To what depth in a rock surface are fungal interaction processes apt to occur? Is this strictly a surface phenomenon, not even penetrating through a 30 micron thick thin section, or are the effects of such processes in naturally exposed rock surfaces apt to penetrate to somewhat deeper depths?

How likely are Ca-oxalates and glushkinite to survive for extended periods of time on natural surfaces? Are these minerals thermodynamically stable at Earth surface conditions, or are they apt to be dissolved and/or replaced by more stable mineral forms? These questions have implications for recognizing the products of fungal interaction in ancient strata and in rocks from other planets.

Regarding the discussion of concentric Ca-oxalate crystals and potential diagenetic pathways in lines 29-30 on page 464, I disagree with their comparison to sedimentary ooids. Although concentric, layered forms, the internal microstructure of these crystals differs significantly from that of marine ooids. Given their tiny size (˜4 microns), they do not fall within the size range of ooids (sand size fraction, 0.06-2 mm). Rather, they are likely to remain within the mud size fraction ($<$0.06 mm). Finally, the restriction of the products of fungal-rock interactions to surfaces indicates that these crystals are not likely to make up a large component of any rock body in the geologic record.

There is a morphological similarity between your spindle-shaped glushkinite and dumbbell-shaped dolomite grown in a liquid medium by Vasconcelos et al. (2005) Geology, v. 33, p. 317-320. Perhaps there are some comparisons to be drawn.

TECHNICAL COMMENTS Although the grammar is excellent overall, there are some minor problems throughout the document in the use of the plural versus singular form.

BGD

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A couple of examples include (1) Section header 3.1 “thin sections substrate” should be “thin section substrates;” (2) on page 465, lines 11-12, the text should read “Ěin present day caliche layers, weathering of carbonate buildings, and in plant litterĚ”

Interactive comment on Biogeosciences Discussions, 2, 451, 2005.