

## ***Interactive comment on “Interpretation of kinetic isotope fractionation between aqueous Fe(II) and ferrihydrite under a high degree of microbial reduction” by Lei Jiang et al.***

### **Anonymous Referee #2**

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The manuscript “Interpretation of kinetic isotopic fractionation between aqueous Fe(II) and ferrihydrite under a high degree of microbial reduction” compares Fe isotopic fractionation between Fe(II) and Fe(III) in ferrihydrite during ferrihydrite reduction by two strains of *Shewanella* at atmospheric pressure and 15 MPa.

General comments The main goal of the study and the research questions are not clearly stated. The use of pressure is not discussed. It is unclear what the pressure experiments bring to the study. In itself, the role of pressure on Fe isotope fractionation is a valid question (with an adequate experimental design), but it is only mentioned in the abstract and is apparently used in the study as a way to modulate Fe(III) reduction

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rates. It would have been beneficial to determine the mineralogy of Fe minerals as a function of time. Fe(II) catalyzes mineral transformation at the surface of Fe(III) oxides and mineral transformation might potentially influence Fe fractionation.

Specific comments First sentence of abstract is unclear about what the topic of the study is. I.55-56 reference missing for the procedure (Schwertmann & Cornell) I.57-60 should be moved to “Iron isotope measurements section” I.71 It is unclear what the DIR experiment media are I.72 what is the concentration of ferrihydrite? What is the starting cell concentration? Figure 1: why is the total concentration of Fe(II) decreasing at incubations of WP3 at ambient pressure? I.112-113 What does the ratio of Fe(II) sorbed to Fe(II) aqueous indicate? What is its significance? I. 131-135 The effects of pressure on Fe(III) reduction have been previously investigated for *S. piezotolerans* WP3 (Wu et al. 2013 Geobiology) and for *Shewanella profunda* (Picard et al. 2015 Frontiers). I.137-139 not all appropriate references are used

Technical comments I.31 “forming a wide range of soluble Fe(II)”: replace by “producing soluble Fe(II)” I.35 replace “, in showing” by “have shown” I.36-37 Be specific: are you talking about the yield of the reaction (how much Fe(III) is reduced overall during the experiment) or the rate at a specific time I.38 Replace “Seems to no effect on” by “does not seem to impact” I.46 Replace “less” by “low” I.61 Plural of medium is “Media” Figure 1: typo in piezotolerans in the figure panels a and c. Also found throughout the manuscript I.102 and after: mM instead of mM L-1 I.109-110 It is a well-established fact that low crystalline Fe(III) minerals are reduced more and faster than crystalline Fe(III) oxides. Use appropriate references

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