Biofilm Regulated Gene bifA in *Pseudomonas putida* MnB1 Effect on Dissolution and Oxidation of Rhodochrosite

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It is well known that biofilm development plays critical roles in microbial weathering of minerals. Several genes affect biofilm formation and evolution through regulating expression of surface proteins and secretion of extracellular polymers substance. However, little is known about the effects of biofilm-regulating genes on microbial weathering of minerals. In this study, we employed a wild strain *Pseudomonas putida* MnB1 (MnB1), a common Mn-oxidizing bacterium, and a biofilm-regulating gene bifA mutant strain (MnB1(ΔbifA)) for assessing the effects of biofilm regulated gene bifA on the dissolution and oxidation of rhodochrosite.

The results indicated that the mutant strain MnB1(ΔbifA) obviously accelerated the rhodochrosite degradation rate comparing with the wild strain, especially at the late stationary stage. But the biofilm biomass of MnB1(ΔbifA) , at the logarithmic stage, was even only the half of that of the wild strain, and the maximum biofilm levels of MnB1(ΔbifA) was similar to wild strain after 24 h because of the accumulation of C-di-GMP at the stationary later stage. Meanwhile, we also found that MnB1(ΔbifA) produced a higher concentration of organic acid such as gluconic acid at this stage. In further, decrease of biofilm dispersion due to bifA deletion increased the homogeneity of Mn(IV) spatial distribution within the biofilm comparing with the wild stain. So, it is deduced that the enhanced rhodochrosite dissolution is attributed to the increase in secretion of organic acids at the logarithmic stage and the transportation of Mn(IV) in biofilm at the stationary later stage.

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