Impact of amorphous calcium carbonate on carbon isotope signatures of biogenic Ca-Mg carbonate

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Experimental Result

In order to clarify the impact of amorphous calcium carbonate (ACC) on carbon isotope signatures of carbonate in the presence of bacteria, mineralization experiments were carried out in the systems with *Arthrobacter* sp. MF-2. The results show that the $\delta^{13}C$ values of Ca-Mg carbonate minerals gradually decreased during the initial stage of mineralization process (0~20 days) and remained relatively stable during 20~50 days (Fig. 1). It is worth noting that large carbon isotope fractionation associated with the transformation process from ACC to crystallographic carbonate regardless of Mg/Ca molar ratio in culture media.

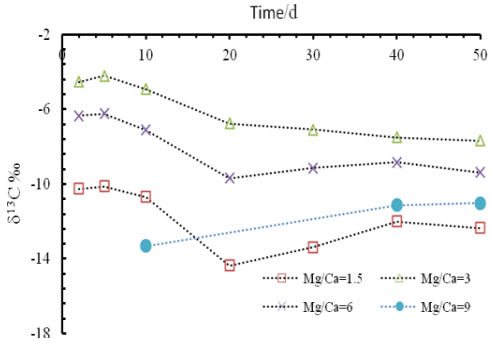

Figure 1 Temporal changes of the $\delta^{13}C$ of Ca-Mg carbonate induced by strain HJ-1

Discussion of Result

The changes of $\delta^{13}C$ values of carbonate minerals reflect that the carbon isotope composition of minerals was affected by bacterial metabolism. At the same time, the effect of ACC on carbon isotope composition also could not be ignored. Although strain HJ-1 preferentially oxidized light carbon (^{12}C) during the bacterial mineralization process and produced more $^{12}CO_3^{2-}$ in culture media, the high percentages of Mg in ACC accelarated the combination of $^{13}CO_3^{2-}$ and Ca^{2+} in the initial stage. In addition, the disordered structure of ACC and its dissolution-recrystallization process resulted in significant fractionation of carbon isotopes.