

Formation of huntite by *Lysinibacillus* sp. strain GW-2

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It is believed that sequestration based on the chemical fixation of CO₂ in the form of carbonate minerals is a safe and permanent method of disposing of anthropogenic CO₂ emissions. In order to clarify if bacteria have the ability to induce the formation of carbonate minerals in the environment without CO₃²⁻/HCO₃⁻ and to discuss their precipitation mechanism by microorganisms, culture experiments with and without *Lysinibacillus* sp. strain GW-2 in the B4 medium with 2:1 molar ration of Mg/Ca for 50 days were carried out. During the incubation, cell density, the weight of precipitate, the pH value and the electrical conductivity, the calcium and magnesium concentrations of the medium were determined. The morphologies of carbonates were observed by using scanning electron microscopy, and their mineral species were determined by X-ray diffraction. The results demonstrated that: (1) the weight of precipitate in the biotic experiments increased gradually with the incubation time, while precipitate was not obtained in the abiotic experiments. This indicated that strain GW-2 might induce the carbonate precipitation in the medium without CO₃²⁻ and HCO₃⁻. (2) There were significant positive correlations between cell density and average precipitation rate. This implied that the bacterial amount directly affected the carbonate precipitation. (3) The three species of carbonate minerals formed according to the following trend: amorphous calcium carbonate (ACC) → huntite → high-Mg calcite. In fact, huntite is a rare carbonate mineral whether in the nature or in laboratory experiments. We infer that huntite formed through ageing of ACC in our study. It is interesting in our study that both rich-Ca calcite and rich-Mg huntite formed, whereas dolomite of which the chemical composition is intermediate between them did not form. This information might be helpful for interpreting “dolomite problem”. This work was supported by the National Natural Science Foundation of China (grants No: 41172308 and 41673083).