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

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It is believed that sequestration based on the chemical fixation of CO_2 in the form of carbonate minerals such as calcite and magnesite is a safe and permanent method of disposing of anthropogenic CO_2 emissions. In order to clarify if bacteria have the ability to induce the formation of carbonate minerals in the environment without CO_3^{2-}/HCO_3^- and to discuss the mechanism of carbonate precipitation 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 quantity of precipitate, the pH and the electrical conductivity, the calcium and magnesium concentrations of the medium were determined. The morphologies of precipitated carbonates were observed by using scanning electron microscopy, and mineral species of carbonate were determined by X-ray diffraction. The results demonstrated that: (1) the quantity 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 CO_3^{2-} and HCO_3^-. (2) There were significant positive correlations between cell density and average precipitation rate. This implied that the cell density directly affected the precipitation of carbonate minerals. (3) The three carbonate minerals formed according to the following trend: amorphous calcium carbonate (ACC) → huntite → high-Mg calcite. We infer that huntite formed through ageing of ACC. In fact, huntite is a rare carbonate mineral whether in the nature or in laboratory experiments. 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 (grant No: 41172308).