Effect of salinity on bacterial mineralization of struvite

QI-ZHI YAO[1], TIAN-LEI ZHAO[2], HAN LI[2], GEN-TAO ZHOU[2]

[1] School of Chemistry and Materials Science, University of Science and Technology of China, Hefei 230026. qzyao@ustc.edu.cn

[2] School of Earth and Space Sciences, University of Science and Technology of China, Hefei 230026.

Struvite, known as magnesium ammonium phosphate hexahydrate ($NH_4MgPO_4 \cdot 6H_2O$), crystallizes as a mineral with orthorhombic structure. In recent years, struvite has gained more attention from environmental mineralogy because it is not only one of main constituents of urinary stones, but also an eco-friendly slow-release fertilizer. However, struvite crystallization from wastewaters by either bio- or abio-pathway inevitably involves addition of extra Mg^{2+} source. Seawater is rich in reserves and is easy to get, and the high phosphorus recovery efficiency from wastewater has also been achieved in abiotic process with seawater as Mg^{2+} source. Therefore, seawater could be potentially used as an effective Mg^{2+} source for struvite biological recovery. Nevertheless, besides Mg^{2+} ion, there are many other inorganic ions in seawater, especially Na^+ and Cl^- ions, which constitute the main part of seawater salinity. Moreover, the hypersaline restraint on microbe growth is a common phenomenon in nature. Many experiments have revealed that the microbe growth inhibition, even cell plasmolysis and death is often caused by increasing salinity. Here, a halophilic marine actinomycete *Microbacterium marinum sp. nov.* H207 was used as a model microbe to induce struvite mineralization under different saline conditions. The results show that the strain H207 has good ability to mineralize struvite within the pale of seawater salinity, but the induction period for struvite precipitation increases with elevated salinity, and the high saline conditions result in the significantly oriented growth of struvite crystals along its crystallographic [100] direction. Current results could have important implications for struvite bio-recovery, and provide deep insights into bacterial mineralization of struvite.

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