

## **Bacterial mineralization of struvite and potential application to phosphorus recovery**

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In the last two decades, struvite crystallization has been the subject of intense research because it offers a new route to recover phosphorus from wastewaters. However, the abiotic precipitation can hardly generate profits due to supplementation of magnesium salt and alkali source. In recent years, bacterially induced mineralization of struvite has been regarded as a promising strategy. On the one hand, bacterial metabolism of nitrogenous compounds can increase the medium pH by ammonia release, alleviating alkali dosed. On the other hand, the bacteria are also capable of modifying struvite morphology, achieving the valid control on shape and size of struvite, and thus fulfilling the market requirement of struvite as a fertilizer. However, there remains a dearth of research examining the bacterial impact on the struvite morphogenesis. Herein, *Shewanella oneidensis* MR-1 was selected as a model microbe to induce struvite mineralization in the synthetic sludge liquor, and a combination of bacterial and biomimetic mineralization strategies was adopted. Our experimental results show that the strain MR-1 can not only mineralize struvite with the high  $Mg^{2+}$  utility, but also mediate the specific morphogenesis of struvite. Further biomimetic experiments reveal that different bacterial components have different effects on struvite morphology, and low molecular-weight peptides secreted by the bacteria play a dominant role. Moreover, the strain can also directly transform organophosphorus and organic nitrogen into struvite. This will integrate nitrogen and phosphorus removal and struvite recovery. Current results can provide a deeper insight into bacterially mediated struvite morphogenesis, and be potentially applied to phosphorus and nitrogen recovery from various eutrophic wastewaters.

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