Reductive dissolution of zippeite group minerals by *Desulfovibrio desulfuricans*

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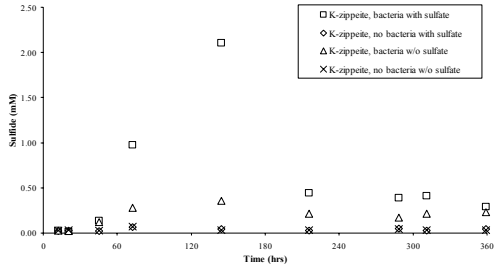
Introduction

Uranium contamination in near-surface aqueous systems has raised interest in the factors controlling its mobility in these environments. Specifically, the reduction of aqueous U(VI) to immobile U(IV) has been the focus of uranium bioremediation studies to date. The intention of this study is to explore the potential for immobilization of U(VI) in solid phase via bacterial reductive corrosion.

Method

Uranyl sulfate minerals of the zippeite group were reacted anaerobically with the sulfate-reducing bacterium *Desulfovibrio desulfuricans* in both the presence and absence of aqueous sulfate. The solution chemistry was investigated to achieve a better understanding of the interactions of bacteria and solid phase U(VI).



Discussion of results

Preliminary results show that significantly greater reductive dissolution occurs where *D. desulfuricans* reacts with K- and Na-zippeite as compared to the experimental controls. The presence of initial SO_4^{2-} does however inhibit the reduction process. SEM data show cells attached to the mineral surfaces with apparent dissolution features as well as the formation of uraninite as a reduction product.

Conclusions

Uranium trapped in solid mineral phases may in fact be a bioavailable reservoir and therefore must be considered in predictive models of uranium transport and remediation.

New field observations on the uranium veins in intrusive rocks as the natural contamination source, NE of Tehran

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The study area is situated in the NE of Tehran (capital of Iran). During field studies we observed pervasive prehnite veins and veinlets cross-cut intrusive massifs such as gabbros, syenites and diorites.These veins show high concentration of U, Th, Nb and Zr (table 1). High aboundance of higromagmaphil elements (like as U) in diffrentiated rocks can be related to the enrichment in primary mantle. These rocks are emplaced during major magmatic events in the late Eocene. Pneumatolitic or hydrothermal fluids that they are originated from a deeper and more diffrentiated source, affected on the plutonic intrusive (Mobarakabad gabbro). The high concentration of uranium in prehnite veins can be related to this process. Some villages like as Mobarakabad and Ardine are located up or downstream of these plutonic intrusives. According to the field studies and geochemical analyses on prehnite veins system, we distinguish high U and Th concentrations about 401 and 236 ppm respectively. This amount is higher than the standard mean crustal values. So that, people who are living in such regions will expose to this contaminations.

element	Gabbro (sample)	Prehnite vein (sample)
U	142 (ppm)	401 (ppm)
Th	5 (ppm)	236 (ppm)
Nb	20 (ppm)	260 (ppm)
Zr	65 (ppm)	274 (ppm)

Table (1)

References

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