was to investigate U (VI) reduction by indigenous bacteria in uranium-bearing black shale sediment and to determine whether microbially-precipitated uranium has long-term stability in subsurface. Through this study, fundamental information on the effects of microorganisms on the fate of redox-sensitive elements in natural settings will be provided. Soil and sediment samples were collected from uranium-bearing black shale in the Dukpyung area in Korea. Microbial inoculum was prepared from soil and sediment slurry supernatant. The reactors were purged with N_2 : CO_2 gas (80 : 20) to maintain anaerobic condition. Glucose, acetate or lactate was added as an electron donor at a final concentration of 5 mM. The reactors were incubated for 40 days at 30°C and concentrations of U, Fe and anions were monitored at set time interval. Uranium was removed from microbial solutions faster than controls. Since dissolved form of U is considered to be U (VI), the result indicated that indigenous bacteria initiated the reduction of U (VI) through either biological or chemical reaction and thus precipitation of uraninite. The observed decrease in dissolved U implied that microbial *in-situ* stabilization of uranium in deep subsurface can be expected. The activity of indigenous bacteria also led to the formation of black precipitates, which were proved to be mackinawite (FeS 0.9) after XRD and SEM-EDS analyses. It seemed that indigenous bacteria reduced Fe^{3+} and SO_4^{2-} into Fe^{2+} and HS^-, respectively, and these two combined to form mackinawite. It is important to consider the risk of uraninite reoxidation after *in-situ* reduction and precipitation in aquifer. However, the biogenic mineral mackinawite may prevent uranium from being re-oxidized even though unexpected change in subsurface environment happens. Indigenous bacteria were observed to be capable of immobilizing uranium in anaerobic sediment with various organic materials supplied. The indigenous bacteria reduced Fe^{3+} and SO_4^{2-}, leading to the formation of mackinawite which can enhance the stability of precipitated uranium. The present results suggest that *in-situ* stabilization of uranium is possible and it may be effectively used in remediation of uranium in contaminated subsurface.

Key words uranium; indigenous bacteria; reduction; black shale; *in-situ* stabilization

The simulation of airborne disease virus transmission in group buildings

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With the densification of population and the deterioration of urban ecological cycle, the airborne disease virus is becoming a new crisis for human. It is well known that airborne disease virus such as smallpox, hives, mumps and SARS can cause respiratory disease by the aerosol of sneezes or cough of infected person. The pathogens release virus aerosol to the environment. If the virus can live some time in the air, it can go with air flowing far away. The aim of the present research is to simulate the transportation of airborne disease virus in a group of buildings by taking into account the time-dependent virus aerosol source. A commonly used virus-host dynamical model is introduced to simulate the time-dependent development of virus aerosol releasing process. The wind velocity field is described by the continuity equation, momentum equation and turbulence model to enclose the Reynolds stress in the momentum equation. The RNG model is used in all simulations. The aerosol of microbial pollutant is assumed flowing at the same velocity as the air. The computation time is one life cycle of virus T. We assume that the pathogens release virus aerosol at the upper wall of building A. The conclusions are: (1) The microbial pollutant begins to be discharged after its delitescence 1/12 T. As the virus goes into logarithmic growth period, the concentration of virus and the pathogenic area increase very fast. After entering the virus decay period (1/3 T), the pathogenic area decreases. It should be noticed that no secondary infection is considered in present simulation. Generally, as the virus concentration is above the pathogenic concentration, new pathogens will be infected and release virus aerosol to the environment. With the increase of new pathogens, the pathogenic area would increase very fast and finally result in the outbreak of infection. The coming paper will consider the secondary infection case. (2) For the above arrangement of buildings and the pathogens releasing virus from the upper wall of building A, the virus can threaten two sides of building A and building B and one side of building C. The other two buildings suffer few effects. Numerical results show that the effects of virus are possible to be reduced by proper arranging the position of buildings according to the wind speed and direction.

Key words numerical simulation; airborne disease virus; virus transmission; group building

Chemical reduction of nitrate by nanoscale Fe/Ni bimetallic particles