Microbiological factors in geological disposal: mathematical model and coupling analysis

Qi Li[1]; Kazumasa Ito[1]

[1] AIST

http://staff.aist.go.jp/qi.li/

Geomicrobiological research is very important in many geoscientific fields (Gaudy & Gaudy, 1980). In particular, the living characteristic of geomicrobes is totally different from its resident circumstance (i.e., rock, soil, and pore water). Although big interests are shown in baseline investigations of environmental and engineering problems related with oil-gas and nuclear industries, the true activities and sequels of geomicrobes are far to be known. With the progressing construction of underground research laboratories all over the world, the integrated site coupling analysis is urgent to mathematically include geomicrobiological effects. Up to now, very little research is being done with considerations of numerical geomicrobiological coupling analyses (Girguis et al., 2008), just because of the very complex and interacting phenomenon of geomicrobes themselves, and the profound multiphysical and mathematical background. In this poster, we introduce the latest advancements of our geomicrobiological coupled simulator (Li & Ito, 2008). Some major factors, such as transport, sorption, growth and decay, of microbes in porous media are considered with focus on geological disposal problem, e.g., storage of HLW, sequestration of CO_2, and burial of municipal garbage. A set of partial differential equations is successfully derived to describe aforementioned geomicrobiological factors, and it is easily integrated with our existed T-H-M-C (Thermal- Hydraulic- Mechanical- Chemical-) coupling framework. The model simulations show us a complete spatial-temporal evolvement of geomicrobes. The parametric studies help us to have an insight into geomicrobiological effects in the deep subsurface environment.

Girguis, P.R., Robidart, J. and Wheat, G., 2008. *The BOSS: A Novel Approach to Coupling Temporal Changes in Geochemistry and Microbiology in the Deep Subsurface Biosphere*.

AGU Fall Meeting 2008, Abstract #B51F-03.

Gaudy, A.F. and Gaudy, E.T., 1980. *Microbiology for Environmental Scientists and Engineers*. McGraw-Hill.

Li, Q. and Ito, K., 2008. *An Integrated Thermal- Hydraulic- Mechanical- Chemical- Biological Multiscale and Multiphysics Coupled System with Applications to Geological Disposal Problems*.

AIST Symposium: The Annual Conference of GREEN 2008, Akihabara Convention Hall, Tokyo, Japan.